Metals Review

THE NEWS DIGEST MAGAZINE

Published by the American Society for Metals

Volume XXIV - No. 7 July, 1951

HOLDEN METALLURGICAL PROCESSES— EQUIPMENT AND SALT BATHS

	Temperature Range
1. LIQUID CARBURIZING BATHS Oil or Water Quench Tempering salts to suit (Case Depth .003 - .070")	1350—1750°F.
2. ALUMINUM HEAT TREATING Aging - Salts	900—1000°F 300— 500°F.
3. BRASS SHELL ANNEALING Water Quench	900—1100°F
4. STEEL SHELL ANNEALING Air Cool	1250—1450°F.
5. HARDENING All types of SAE or NE Steels Tool Steels Water or Oil Quench Temper to meet RC Specifications	1350—1650°F
6. HARDENING High Alloy Steels Stainless Steels	1450—2000°F.
7. HARDENING High Speed Steels Molybdenum High Speed Steels	 2270—2350°F. 2100—2250°F.
8. HARDENING - BRAZING (Naval Brass or Bronze) Naval Brass or Bronze Transfer after brazing to same type bath Oil Quench Temper to meet RC	 1725—1950°F. 1550—1600°F.
9. BRAZING (Copper)	2050—2150°F.
10. SILVER BRAZING	1350—1450°F.
11. ANNEALING	1850—1950°F.

(Continued on back page)

HOLDEN

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VOLUME XXIV, No. 7 **JULY, 1951**

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Published monthly by the American Society for Metals, 7301 Euclid Ave., Cleveland 3, Ohio; Walter E. Jominy, President; John Chipman, Vice-President; William H. Eisenman, Secretary; Ralph L. Wilson, Treasurer; Thomas G. Digges, Elmer Gammeter, James B. Austin, James T. MacKenzie, Trustees; Arthur E. Focke, Past President. Subscriptions $5.00 per year ($6.00 foreign). Single copies $1.00. Entered as Second Class Matter, July 26, 1930, at the Post Office at Cleveland, Ohio, under the Act of March 3, 1879.

Claims for missing numbers will not be allowed if received more than 60 days from date of issue. No claims allowed from subscribers in Central Europe, Asia, or the Pacific islands other than Hawaii, or because of failure to notify the circulation department of a change of address or because copy is "missing from files".

CONTENTS

6th METALLOGRAPHIC EXHIBIT

Rules are simple and few; there are no restrictions as to size or method of mounting, except for entries from overseas. As in the five previous exhibits, the entries will be displayed to good advantage.

CLASSIFICATION OF MICROS

- Cast irons and cast steels
- Toolsteels (except carbides)
- Irons and alloy steels (excluding stainless) in wrought condition
- Stainless and heat resisting steels and alloys
- Light metals and alloys
- Heavy nonferrous metals and alloys
- Powder metals (and carbides) and compacts
- Weld structures (including brazed and similar joints)
- Series of micros showing transitions or changes during processing
- Surface phenomena
- Macrographs of metallurgical objects (2 to 10 diam.)
- Results by non-optical or unconventional techniques

RULES FOR ENTRANTS

Work which has appeared in previous metallographic exhibits held by the American Society for Metals is unacceptable. Photographic prints shall be mounted on stiff cardboard, each on a separate mount, each carrying a label giving:

Name of metallographer
Classification of entry
Material, etchant, magnification
Any special information as desired

Transparencies or other items to be viewed by transmitted light must be mounted on light-tight boxes wired for plugging into lighting circuit, and built so they can be fixed to the wall.

Exhibits must be delivered between Sept. 20 and Oct. 10, 1951, either by prepaid express, registered parcel post, or first-class letter mail.

Address: Metallographic Exhibit
National Metal Congress and Exposition
State Fair Grounds
Woodward & State Fair Ave., Detroit, Mich.

AWARDS AND OTHER INFORMATION

A committee of judges will be appointed by the Metal Congress management which will award a First Prize (a medal and blue ribbon) to the best in each classification. Honorable Mentions will also be awarded (with appropriate medals) to other photographs which, in the opinion of the judges, closely approach the winner in excellence.

A Grand Prize, in the form of an engrossed certificate, and a money award of $100 will be awarded the exhibitor whose work is adjudged best in the show, and his exhibit shall become the property of the American Society for Metals for preservation and display in the Society's headquarters.

All other exhibits will be returned to owners by prepaid express or registered parcel post during the week of Oct. 22, 1951.

Entrants living outside the U.S.A. will do well to send their micrographs by first-class letter mail endorsed "May be opened for customs inspection before delivery to addressee". To meet regulations of the international mails, size of mount must be no larger than 14 x 18 in.

WORLD METALLURGICAL CONGRESS
33rd NATIONAL METAL CONGRESS AND EXPOSITION

DETROIT, MICH. **OCTOBER 15 TO 19, 1951**

147 Leading Plants Open Doors to Foreign Visitors Attending World Metallurgical Congress

SOME 147 of the leading metal-working industries and scientific and educational institutions of the country have indicated their desire to be included on one or more of the eight study tours that are to precede the World Metallurgical Congress, to be held in Detroit, Oct. 13 to 19.

These declarations insure the success of this important phase of the international metal conclave which is bringing to the United States upwards of 400 metal scientists and top executives from some 20 Marshall Plan countries and other free nations of the world.

The World Metallurgical Congress, wholely sponsored by the American Society for Metals, will be held concurrently with the 33rd annual National Metal Congress and Exposition.

Dr. Zay Jeffries, director-general of the Congress, states that the "response from those companies invited to participate as tour hosts has been such as to indicate that an unusual experience awaits the many distinguished visitors who are to be our guests this fall."

The study tours are scheduled for the four weeks (Sept. 13 to Oct. 12) prior to the international gathering in the motor capital. At least 50 cities in 12 states will be visited, according to Jeffries. Every effort to establish tours that provide complete coverage within the scope of the industry classification has been made.

"The host organizations," states Jeffries, "are to be found among the industrial and scientific '400' of the nation."

Advance registrations indicate that approximately 225 will travel on the study tours. Of this number, nearly 200, who have qualified as official conferees, will participate under the provisions of a "technical assistance project" of the Economic Cooperation Administration, which is assisting the Congress.

Many other foreign visitors plan to attend the scientific sessions of the conclave, and will contribute to the meetings and technical sessions in Detroit.

Firming of the study tour itineraries the last week in June gives a comprehensive view of the elaborate and highly informative schedule that awaits the conferees.

In Tour No. 1 on steelmaking and refining, the conferees will have an opportunity to visit 15 of the country's leading steel plants and steel mills. They will see strip and sheet steelmaking, the largest openhearth shop in the world, electric practice on carbon and alloy steel, an integrated steel mill with emphasis on blast furnaces and rail mill, and electric furnace melting of production carbon steels and the direct rolling of such steels. They will visit one of the country's largest research laboratories, inspect the melting and fabrication of tool and specialty steels, acid openhearth refining, alloy steel foundry operations, bessemer practice, and the manufacture of steel mill machinery.

Hotel reservation forms for the National Metal Congress and Exposition, in conjunction with the World Metallurgical Congress, were mailed last week to all A.S.M. members. The three events will be held concurrently in Detroit the week of Oct. 13.

Hotel Statler will be the headquarters of the American Society for Metals, and Hotel Tuller, just across the street, will house the World Metallurgical Congress.

The National Metal Exposition—far and away the largest ever to be sponsored by the A.S.M.—will have ample accommodations in the many buildings available at the Michigan State Fair Grounds. More than 400 exhibitors have already signed up for floor space exceeding a total of 125,000 sq. ft.

Tour 2 on rolling and fabrication of copper, aluminum, magnesium, and their alloys, will take its members through 14 plants from Waterbury, Conn., to Chicago, and back to Detroit. Brass making, copper rolling and wire making, copper alloy research, making of valves and plumbing supplies, manufacture of aluminum, casting of bronzes, die casting of aluminum and zinc alloys, and the manufacture and production of bearings are among the processes on the schedule.

Tour 3A on ferrous fabrication in heavy industry, (rolling, forging and hot work) will stop at 19 companies. The visitors will study locomotive and hydraulic machinery, the rolling of plate, the making of die blocks, drop forgings, large pipe and chemical vessels. Heating by induction will also be demonstrated. The itinerary extends from Ansonia, Conn., to Milwaukee, Wis., and points in between.

Tour 3B on metal fabrication in lighter industry lists 18 stops. Stamping, cold work, machining and finishing are the principal fields included. In addition to plants specializing in these primary operations, the visitors will inspect their applications in the manufacture of kitchen cabinets, tubs and dish-washers, precision equipment and instruments, machine tools, hardware, watches, springs, and auto bodies and engines.

Tour 4 on heat treatment has 22 host companies. The route of travel leads from Hartford, Conn., to Chicago, with side trips to Peoria, Ill., Muncie, Ind., and Muskegon, Mich. Every type of heat treatment operation will be demonstrated on a wide range of materials including tool-steels and specialty steels, brass and other nonferrous alloys, and cast iron.

Tour 5 on welding and joining will include not only manufacture of welding equipment and supplies, but also plants where modern and unusual welding operations may be observed. Welding of tanks and structures, locomotives, ships, household appliances, freight cars, and automotive parts will be demonstrated, and the itinerary has been arranged to include all of the important welding methods.

Tour 6 covers the field of inspection and testing. Here again actual inspection of operations in plants manufacturing a variety of products and equipment will be seen, and a number of special laboratories will be visited.

Tour 8 is on research, education and technical societies. Twenty-five institutions are planning programs presenting research and technical training procedures. They will include commercial and endowed research laboratories, government laboratories, universities, technical libraries, and plant laboratories.

Few foreign study groups have been offered so wide a range of opportunities for the examination of American industrial "know-how."

"Combined with the World Metallurgical Congress and the National Metal Exposition and Congress, it is felt certain that a strengthening of the brotherhood of scientists throughout the free world will result from these extensive study tours," states Wm. H. Eisenman, executive secretary of the American Society for Metals, sponsor of this international meeting.

Plans for a luncheon of welcome on Sept. 17, on the Starlight Roof of the Waldorf Astoria, and presentation of a citation and medal to President Harry S. Truman at the White House in Washington on Sept. 21, are now taking shape.

Technical Program

Detroit, Oct. 15-19, 1951

Tentative Program of Technical Papers for National Metal Congress, Numbered for Ordering of Preprints

All of the numbered papers herewith will be preprinted for distribution to members of the American Society for Metals. The society will print only 10% in excess of the number of orders for preprints in the office on press date, and this excess 10% will be sent out as long as it lasts. Order by number from this list before August 15, 1951.

Monday, Oct. 15—9:30 A. M.

Constitution Diagrams

1. **Constitution and Properties of Cobalt-Iron-Vanadium Alloys,** by D. L. Martin and A. H. Geisler, General Electric Research Laboratories.
2. **Phase Relationships in the Iron-Chromium-Vanadium System,** by Howard Martens, Research Engineer, and Pol Duwez, Associate Professor of Mechanical Engineering and Chief of Materials Section, Jet Propulsion Laboratory, California Institute of Technology.
3. **A Partial Titanium-Chromium Phase Diagram and the Crystal Structure of $TiCr_2$,** by Pol Duwez, Associate Professor of Mechanical Engineering and Chief of Materials Section, and Jack L. Taylor, Research Engineer, Jet Propulsion Laboratory, California Institute of Technology.
4. **The Titanium-Silicon System,** by M. Hansen, Supervisor, and H. D. Kessler and D. J. McPherson, Research Metallurgists, Nonferrous Metals Research, Armour Research Foundation.
5. **The Indium-Antimony System,** by T. S. Liu, Teaching Fellow, and E. A. Peretti, Professor of Metallurgy, University of Notre Dame.

Monday, Oct. 15—2:00 P. M.

Diffusion

6. **Interstitial Diffusion,** by A. G. Guy, Associate Professor of Mechanical Engineering, University of North Carolina.
7. **The Carbonitriding of Carbon and Alloy Steels,** by H. C. Fiedler, M. B. Bever and C. F. Floe, Department of Metallurgy, Massachusetts Institute of Technology.
8. **Chromium Diffusivity in Alpha Cobalt-Chromium Solid Solutions,** by John W. Weeton, Research Metallurgist, Lewis Flight Propulsion Lab., National Advisory Committee for Aeronautics.
9. **Anisothermal Diffusion of Carbon in Austenite,** by J. E. Black, Captain, Ordnance Department, U. S. Army, Detroit Arsenal; and G. E. Doan, Professor and Head, Department of Metallurgical Engineering, Lehigh University.

Tuesday, Oct. 16—9:30 A. M.

High-Temperature Alloys

10. **Carbide Reactions in High-Temperature Alloys,** by J. R. Lane, Naval Research Laboratory; and N. J. Grant, Associate Professor of Metallurgy, Massachusetts Institute of Technology.
11. **The Formation of Sigma Phase in 13 to 16% Chromium Steels,** by H. S. Link and P. W. Marshall, U. S. Steel Co., Research & Development Laboratory.
12. **Electrolytic Etching—the Sigma Phase Steels,** by John J. Gilman, Crucible Steel Co. of America, Research Laboratory.
13. **Composition Limits of Sigma Formation in Nickel-Chromium Steels at 1200° F. (650° C.),** by M. E. Nicholson, Assistant Professor, The Institute for the Study of Metals, University of Chicago; C. H. Samans, Associate Director, Materials Division, Standard Oil Co. (Indiana); and F. J. Shortsleeve, Research Assistant, Case Institute of Technology.
14. **Ferrite Formation Associated with Carbide Precipitation in 18 Cr, 8 Ni Austenitic Stainless Steel,** by E. J. Dulis and G. V. Smith, Research Laboratory, U. S. Steel Co.

Tuesday, Oct. 16—2:00 P. M.

High-Temperature Alloys

15. **Cast Heat Resistant Alloys of the 21% Chromium, 9% Nickel Type,** by Howard S. Avery, Research Metallurgist, Charles R. Wilks, Metallurgist, and John A. Fellows, Research Metallurgist, American Brake Shoe Co.
16. **Influence of Extended Time on Creep and Rupture Strength of 16-25-6 Alloy,** by C. L. Clark and M. Fleischmann, Metallurgical Engineers, Steel & Tube Division, Timken Roller Bearing Co.; and J. W. Freeman, research engineer, University of Michigan.
17. **Isothermal Transformation, Hardening and Tempering of 12% Chromium Steel,** by R. L. Rickett, Research Laboratory, U. S. Steel Co., W. F. White and C. S. Walton, U. S. Steel Co., Pittsburgh; and J. C. Butler, South Works, U. S. Steel Co.
18. **Cladding of Molybdenum for Service in Air at Elevated Temperature,** by W. L. Bruckart, Research Engineer, and R. I. Jaffee, Supervisor in Nonferrous Physical Metallurgy, Battelle Memorial Institute.

Wednesday, Oct. 17—9:30 A. M.

ASM Annual Meeting

* Edward DeMille Campbell Memorial Lecture

Wednesday, Oct. 17—2:00 P. M.

Embrittlement

19. **Effects of Decomposition of Retained Austenite During Tempering on Notch Toughness and Tensile Properties,** by E. F. Bailey and W. J. Harris, Jr., Members of Ferrous Alloys Branch, Naval Research Laboratory.
20. **Comparison of the Effects of Alloying Elements on the Lower and Upper Transition Temperatures in Pearlitic Steels,** by J. A. Rinebolt and W. J. Harris, Jr., Ferrous Alloys Branch, Naval Research Laboratory.
21. **Effect of Retained Austenite Upon Mechanical Properties,** by L. S. Castleman, Atomic Power Div., Westinghouse Electric Corp.; B. L. Averbach, Assistant Professor of Physical Metallurgy, and Morris Cohen, Professor of Physical Metallurgy, Massachusetts Institute of Technology.
22. **Some X-Ray Diffraction and Electron-Microscope Observations on Temper-Brittle Steels,** by S. R. Maloof, Research Metallurgist, Springfield Armory.

* Not preprinted.

Thursday, Oct. 18—9:30 A. M.

Mechanical Metallurgy

23. **Delayed Yield in Annealed Steels of Very Low Carbon and Nitrogen Content,** by D. S. Wood, Assistant Professor, and D. S. Clark, Associate Professor, Department of Mechanical Engineering, California Institute of Technology.

24. **The Determination of Flow Stress from a Tensile Specimen,** by E. R. Marshall, Instructor of Metallurgy, and M. C. Shaw, Associate Professor of Mechanical Engineering, Massachusetts Institute of Technology.

25. **Strain Aging Effects,** by J. D. Lubahn, Metallurgy and Ceramics Divisions, General Electric Co.

26. **Fatigue Strength of Large, Notched Steel Bars Surface Hardened by Gas Heating and by Induction Heating,** by S. L. Case, J. M. Berry and H. J. Grover, Battelle Memorial Institute.

27. **Effect of High Heating Rate on the Tensile Properties of Metals,** by W. K. Smith, Metallurgist, C. C. Woolsey, Metallurgist, and W. O. Wetmore, Head, Metallurgy Branch, U. S. Naval Ordnance Test Station.

Thursday, Oct. 18—2:00 P. M.

Heat Treatment

28. **Stress-Induced Transformation of Retained Austenite in Hardened Steel,** by B. L. Averbach, S. G. Lorris and Morris Cohen, Department of Metallurgy, Massachusetts Institute of Technology.

29. **An Investigation of the Quenching Characteristics of a Salt Bath,** by M. J. Sinnott, Associate Professor of Chemical and Metallurgical Engineering, and J. C. Shyne, Graduate Student, Department of Metallurgical Engineering, University of Michigan.

30. **Limitations of the End-Quench Hardenability Test,** by A. R. Troiano, Professor of Physical Metallurgy, and L. J. Klingler, Senior Research Associate, Case Institute of Technology.

31. **A Correlation of End-Quenched Test Bars and Rounds in Terms of Hardness and Cooling Characteristics,** by E. W. Weinman, Research Metallurgist, R. W. Thomson, Assistant Head, and A. L. Boegehold, Head, Department of Metallurgy, General Motors Corp.

Friday, Oct. 19—9:30 A. M.

Physical Metallurgy

32. **Particle Size Analysis of Metal Powders,** by C. C. Gregg and Bernard Kopelman, Sylvania Electric Products, Inc.

33. **Interrelation of Mechanical Properties, Casting Size, and Microstructure of Ductile Cast Iron,** by R. W. Kraft and R. A. Flinn, Metallurgy Department, American Brake Shoe Co.

34. **Gas Evolution From Gray Cast Iron During Enameling,** by L. F. Porter, Research Metallurgist, and P. C. Rosenthal, Professor of Metallurgy, Department of Mining and Metallurgy, University of Wisconsin.

35. **Aluminum—6% Magnesium Wrought Alloys for Elevated-Temperature Service,** by K. Grube, Research Engineer, and L. W. Eastwood, Supervisor, Nonferrous Metallurgy, Battelle Memorial Institute.

36. **A Study of the Microhardness of the Major Carbides in Some High Speed Steels,** by P. Leckie-Ewing, Metallurgist, Union Twist Drill Co., Butterfield Division.

Paper to Be Presented on Seminar "Metal Interfaces"

37. **The Shape of Metal Grains, With Some Other Metallurgical Applications of Topology,** by Cyril Stanley Smith, Director, Institute for the Study of Metals, University of Chicago.

Performance of Welded Ship Steels Linked to Transition Temperatures

Reported by W. Mack Crook

Consulting Engineer

A study conducted under the auspices of the Ship Structure Committee on failures of welded vessels was described before the Texas Chapter A.S.M. on May 1 by H. M. Banta of Battelle Memorial Institute. This study revealed that structural failures in the decks and hulls of welded vessels were most prevalent during cold weather. Extensive research work further established that the service performance of the steel plate used in these vessels was associated with the transition temperature of the steel—the temperature at which the steel changes from ductile to brittle behavior. Steels made under conditions normally considered identical, and processed in the same manner, can differ widely in their transition temperature characteristics, although their chemical composition and tensile properties are similar.

To obtain a better understanding of the factors influencing the transition temperature, a study was made of the effect of chemical composition, deoxidation, and finishing temperature. For this investigation, Class A and Class B steels of the American Bureau of Shipping were made in 200-lb. semikilled laboratory heats.

This work showed that the transition temperature, as determined by the Navy tear test, of the Class A and Class B steels was progressively raised, (and raised to an appreciable extent), by increasing the carbon content through the range from 0.12 to 0.36%. A similar effect was noted for phosphorus in the range 0.011 to 0.052% and for vanadium within 0.08 to 0.19%. Increased sulphur did not raise the transition temperature but possibly lowered it. However, in the range that sulphur occurs in commercial steels, it is not expected to have a significant effect. As a silicon content was raised up to about 0.16%, the transition temperature decreased, but appeared to follow an upward trend as the silicon was increased beyond this point.

The transition temperature was definitely lowered by increasing the manganese content. For example, increasing Mn from 0.40 to 1.40% lowered the transition temperature from about 60° F. to 20° F. for a 0.25% carbon steel finished at 1650° F.

Aluminum content has a marked influence, the transition temperature being progressively lowered with higher aluminum. The use of aluminum, however, is limited to very small additions so as to prevent complete deoxidation and the production of a killed steel.

Temperature at which the hot rolled plate was finished had a pronounced effect, and transition temperature decreased with lower finishing temperatures.

Since steels similar to those used in ship construction are also used for large-diameter welded pipe lines, information developed along this line should be of considerable interest to the pipe line industry.

Jominy Continues in Dual Role

Reported by G. A. Stemple

Consolidated Gas, Electric, Light & Power Co.

Baltimore Chapter A. S. M. was again fortunate this year in having the National President, Walter E. Jominy, as guest speaker for the last session of the current season on May 8.

Mr. Jominy, in the absence of Bill Eisenman, gave the coffee talk as well as the technical lecture. In the coffee talk he presented information pertinent to A. S. M. national activities. "Reducing Wear by Proper Metallurgy" was presented at the technical session.

A lively discussion following the lecture was engineered by Carl Zapffe, technical chairman.

Engineering Control Broadens Field for Meehanite Castings

Reported by Kenneth E. Hazeldine
E. T. Hazeldine Co.

Speaking on the engineering properties and performance of Meehanite castings at the April meeting of the Terre Haute Chapter A.S.M., C.R. Austin, assistant to the president of Meehanite Metal Corp., gave a broad picture of the importance and significance of metallurgical control, of basic engineering properties, and of improved design in the application of Meehanite castings to a large variety of engineering services.

His talk was preceded by a short film in color prepared by the Meehanite Metal Corp. illustrating the effect of gating on the flow of metals into molds.

It is of utmost importance that the materials or design engineer should first be assured of complete solidity, uniformity of properties, and of property characteristics in the casting as distinct from correlated characteristics in a test bar, the speaker stressed. It is then the function of the foundry to produce the castings according to clearly defined specifications. This involves metallurgical control of both size and distribution of the flake graphite as well as the fully pearlitic structure of the matrix. Techniques have been developed to maintain these engineering specifications, essentially independent of casting section.

Data in the form of tables or plotted curves were shown to illustrate such property characteristics as tensile and yield strength, modulus, impact at normal and subzero temperatures, comparisons of notch sensitivity, damping capacities and resistance to seizing and galling. Of particular interest to the engineer were the stress-strain curves under tensile and transverse load showing true moduli values which can be used in a defined engineering manner.

In creep properties the engineering types of Meehanite castings behave similarly to the fabricated carbon steels. The effects of heat treatment were illustrated by tensile properties and microstructure after quench and draw, martemper and interrupted quench treatments.

In order to obtain the maximum in economy and service, the engineer must work closely with the foundry, and Dr. Austin presented examples showing the effects of improved design.

Dr. Austin concluded his address with pictorial illustrations of service applications. Both wear and corrosion resistant Meehanite, as well as the more general engineering types, were illustrated for such purposes as the manufacture of ferric chloride and of sulphuric acid, dimensional stability in machine tools, grinding plates for attrition mills, mills trucks for transporting heavy ingot molds, and tires and rollers for driers weighing up to 40 tons. Particularly arresting was the use of Meehanite rolls up to 36 in. in diameter for cold forming steel plate 2½ in. thick.

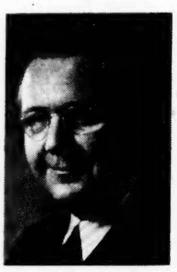
In a coffee talk after the dinner, Don Clotier used colored slides to portray a trip through the Thompson Symon Sign Co. plant, where various methods of reproducing pictures on signboards are practiced.

Chapter officers for 1951-52 were elected at this meeting.

Braze Welding Is Modern Development Differing From Brazing, Kugler Explains

Reported by Kempton H. Roll
Lead Industries Association

"Brazing" is a term that is currently used, though incorrectly, to describe two distinct methods of joining metals. Brazing dates back to early Egyptian times while "braze welding" is a modern development. The distinction between these two methods of welding was described in detail by Arthur N. Kugler, noted authority on brazing, before the New York Chapter A.S.M. on May 14.


A. N. Kugler

True brazing requires that the parts be closely fitted in the general form of a lap joint, he explained. Into this lap joint a highly fluid brazing alloy is caused to flow by capillary attraction. When cooled, such a connection results in a joint that is strong and ductile and eminently satisfactory for many services.

The other joining method often incorrectly called "brazing" involves the use of grooved butt joints as well as fillet welds. Generally, this method employs a brass filler metal somewhat similar in composition to the spelter brazing alloy long in use. However, such a connection—which is more properly designated as braze welding — is dependent for its strength upon the strength of the filler metal. A true braze, on the other hand, is less dependent upon filler metal strength and more upon bond strength.

Examples of both techniques of joining were illustrated by Mr. Kugler who has been associated with many welding developments since joining the Air Reduction Sales Co. in 1929.

THIRTY YEARS AGO

The May 1921 issue of the *Transactions* of the American Society for Metals (predecessor of A.S.M.) announces the election of PROF. ALBERT SAUVEUR† to honorary membership in the Society. There were only two other honorary members at that time—SIR ROBERT HADFIELD † of London and HENRY MARION HOWE †. Later known as the "dean of American metallurgists", Professor Sauveur's contributions to fundamental metallurgical science are commemorated in the A.S.M.'s Sauveur Achievement Award.

— 30 —

One of the first of the educational programs to be sponsored by a local chapter was conducted by Chicago. Covering various aspects of heat treatment and metallography, this highly successful instructional course was a cooperative venture with Armour Institute of Technology and Lewis Institute.

— 30 —

The course was directed by F. C. LAU,† secretary, Arrow Forge and Tool Works, and chairman of the Chicago Chapter; and an educational committee consisting of T. E. BARKER,† chairman; E. J. JANITZKY, and C. P. BERG.

— 30 —

New members listed in May included NORMAN F. TISDALE of Springfield, Mass. (since 1935 chief metallurgical engineer of Molybdenum Corp. of America, and an A.S.M. national trustee in 1942).

— 30 —

Among the "Commercial Items" in May 1921 appears the following announcement: "As a result of an exhaustive series of tests carried out under actual operating conditions in various heat treating plants in the country, the LUDLUM STEEL CO., Watervliet, N. Y., has developed a new heat resisting metal known as silcrome". First application was for annealing and carburizing boxes.

— 30 —

Nominations of national officers for 1921-22 were announced in June. For president the committee selected F. P. GILLIGAN of Hartford, Conn. (now secretary-treasurer of Henry Souther Engineering Co., recipient of an A.S.M. Alloy Steel Distinguished Service Award in 1948); for first vice-president, F. C. LAU† of Chicago; for second vice-president R. J. ALLEN of Springfield, Mass. (now metallurgist for Worthington Pump and Machinery Corp., Harrison, N. J.; for treasurer, J. V. EMMONS of Cleveland (now chief metallurgist, Cleveland Twist Drill Co.); and for director J. J. CROWE of Philadelphia (now vice-president, Air Reduction Sales Co.).

† Deceased

Stagg Addresses Old-Timers at Detroit; Tells of Toolsteel Status Under NPA

Reported by T. J. Phillips
Alloy Steels, Inc.

A capacity audience of 400, including over 70 members having a record of more than 25 years' membership in A.S.M., gathered to hear Howard J. Stagg, metallurgical consultant, Crucible Steel Co. of America, on Detroit's "Old Timer's Night" on May 14. Mr. Stagg's subject was "Some Aspects of Toolsteel".

Mr. Stagg, an "old timer" in his own right, (A.S.M. second vice-president, 1919-1920), opened his discussion by directing the thinking of his listeners to the critical shortage of alloys and the fact that there would be no need for alloys to increase the hardenability of steel, if a method of cooling the center of large cross-sections at about the same rate as the outside could be devised. He said that such "induction cooling" would release 90% of the alloys for the much needed high-temperature applications.

The NPA order requiring 80% of all high speed tools to be made from a steel containing less than 12% tungsten should find the majority of the tool manufacturers fully prepared to use the molybdenum-type steels, Mr. Stagg stated. Unlike a similar order issued in the period 1940-45, he stressed the fact that today's order actually calls for use of a better material at less cost. The speaker substantiated this statement with data showing the superiority of M-2 over 18-4-1 from the standpoint of hardness, grain size, toughness, red-hardness and cutting efficiency as measured by Navy cutting tests. Long before the NPA order was issued a voluntary shift to the molybdenum-type steels occurred, Mr. Stagg said. Mill shipments have been on a 70-30 ratio in favor of the molybdenum type for a considerable period. Salt baths or atmosphere-controlled furnaces are recommended to prevent decarburization during heat treatment. M-3 as well as the Molybdenum-cobalt steels are suitable where high wear resistance and red hardness are required.

Mr. Stagg described the method of plotting TTT-curves, with particular emphasis on the low-temperature portion of these curves and its association with cracking of tools and dies during heat treatment. The speaker stressed the importance of making certain that tools be allowed to cool to a temperature where they can be held comfortably in the hands before tempering.

Howard J. Stagg, an Old-Timer in His Own Right (A. S. M. Second Vice-President 30 Years Ago), Speaks Before an Audience Boasting More Than 70 25-Year Members at Detroit Old-Timers' Night

Several slides were presented depicting toolsteel failures resulting from poor design, abusive grinding and misapplication. Recommendations were made by the speaker on avoiding similar failures.

Edward D. Wiard, Illinois Tool Works, acted as technical chairman and conducted an active discussion session following Mr. Stagg's talk.

The dinner meeting which preceded the lecture was highlighted by Charles G. Heilman, president, Commonwealth Industries, reminiscing through the pages of a special brochure printed for the occasion on "How the American Society for Metals Began". He was greeted with thundering applause and his remarks sparked further reminiscences among the three charter members of the original Steel Treating Research Society who were present, as well as many other early members.

Indianapolis Honors Past Chairmen

Past Chairmen of the Indianapolis Chapter Were Honored at the Meeting on May 21. Front row are Dewey M. Mead, Diamond Chain Co. (1938-39); Wm. G. Praed, Manufacturers Agent (1925-27); P. B. Jensen, International Harvester Co. (1940-41); Harold H. Lurie, Cummins Engine Co. (1941-42). Standing are Ralph W. Stahl, Lindberg Engineering Co. (1946-47); Walter E. Ellsworth, Claud S. Gordon Co. (1943-44); Paul F. Ulmer, Link Belt Co. (1945-46); Thomas G. Harvey, U. S. Naval Ordnance Plant (1944-45); John W. Watson, Link Belt Co., (1949-50); John E. Mitchell, U. S. Naval Ordnance Plant (1950-51). (Photograph by Noble York, Metallurgist, Truck Engine Works, International Harvester Co.)

Low Hydrogen Is Key to Welding Of Armor Steels

Reported by Rebecca H. Smith*
Northrop Aircraft, Inc.

A low hydrogen content is essential for successful welding of low-alloy high-strength steels, according to R. David Thomas, Jr., vice-president and director of research and engineering of the Arcos Corp. Mr. Thomas addressed a large crowd at a joint meeting of the Los Angeles chapters of A.S.M. and the American Welding Society on April 19, on "New Developments in the Welding of Alloy Steels."

Armor steel presents one of the most important and difficult problems in welding low-alloy steel, the speaker said. Neither preheat nor subsequent stress-relieving treatment can be allowed on such equipment as tanks and ships; high strength is required, and maximum ductility is needed for good service.

Originally, efforts to improve weldability were concentrated on adjusting the chemical composition with the idea of rendering the steels weldable with any electrode. Where cracking was a bad problem, welding engineers often used 25-20 or other austenitic rods. Recent development work has shown that the freedom from cracking was not due entirely to the austenitic nature of the weld deposit; another and possibly more effective factor was the low hydrogen content of the stainless steel rods because they did not have a cellulose coating. (Actually, the coating was omitted in order to obtain low carbon, since at that time the role of hydrogen in cracking was not thoroughly recognized.)

Today, welding engineers realize that much weld cracking and porosity in low-alloy steels are often caused by hydrogen, Mr. Thomas stated. Any compound which will produce hydrogen in the welding arc must be avoided. The new low-hydrogen rods have no cellulose in the coating whatever and are heated to drive off any water in the binder which ties the ceramic covering to the metallic rod.

Material shortages during World War II furthered the development of low-alloy welding rods instead of such analyses as 25-20. After the war, the Navy sponsored work on a ferritic electrode which would weld low alloy steels without either preheat or postheat, would develop 125,000 psi. tensile strength in the weld, and would have maximum ductility.

Mr. Thomas told of more than 150 different compositions of low-alloy welding rod which were investigated during this program. A manganese-molybdenum rod gave good results but required a preheat of 150° F.; a nickel-molybdenum rod produced sound welds without porosity or cracking but did not have the required strength. Finally, a nickel-molybdenum-vanadium composition met all requirements. Welds were made with 110,000 psi. yield and 120,000 psi. ultimate tensile strength. The limiting figure for moisture content was established at 0.2% for crack-free welds at this strength level. When strength requirements are not so high, moisture content is not so critical.

It is not sufficient to produce electrodes with low hydrogen content; they must be shipped and stored with great care because the electrode coatings tend to pick up moisture readily. Special shipping containers are used, and the speaker recommended storing in an area where humidity is kept about 30%. For best results, low-hydrogen rods should be used within a matter of hours after opening the shipping container.

One interesting fact made evident by the study of low-alloy rods was the effect of preheat on welds. Although higher preheat temperatures help to prevent cracking, the welds have lower resistance to impact than those made with lower preheat, according to Mr. Thomas.

Weld cracking is often due to carbon pickup, and Mr. Thomas described welding techniques that will minimize this difficulty. This point, like the others made by the speaker, was well illustrated by slides. A lively question-and-answer period followed Mr. Thomas's talk.

*A similar report covering a meeting of the Golden Gate Chapter addressed by Mr. Thomas was submitted by George H. Thurston, metallurgist of Benicia Arsenal. It covered essentially the same points as brought out in Mrs. Smith's report.

Alloying a Science Harrington Explains

Reported by T. J. Phillips
Service Manager, Crucible Steel Co. of America

"Alloying as a Science" was elucidated by R. H. Harrington, research associate, General Electric Research Laboratory, before the April meeting of Detroit Chapter A.S.M.

Dr. Harrington classified binary alloy systems into four main types (with a total of 12 sub-types) based on their liquidus-solidus geography. The contributions to metallurgy by recent crystal chemistry were then briefly reviewed.

Four chief alloying factors underlie the construction of the 12 types of binary systems, Dr. Harrington demonstrated. These four "chief alloying factors" are actually measurable properties of the pure metal elements as follows: (1) atomic size, (2) crystal structure bonding, (3) periodic grouping, (4) type of crystal lattice. All of the known reactions in the solid state of alloys were briefly described.

Dr. Harrington concluded his discussion with examples of some recently developed zinc, aluminum, and copper-base alloys and some new treatments for these. Some unusual properties, he explained, have been developed by "stress-aging" (aging under an externally applied stress).

Fred Bens, supervisor, Climax Molybdenum Co., acted as technical chairman and conducted an active discussion session.

Noble Travis, vice-president of the Detroit Trust Co., gave a coffee talk outlining the program for Detroit's 250th Anniversary Festival.

Lehigh Valley Educational Lecturers

Lehigh Valley Chapter A.S.M. Conducted a Spring Educational Lecture Series on "Selection and Application of Metallic Materials". Speakers and their topics were (left to right): James H. Dunn, Aluminum Co. of America, "Aluminum and Magnesium in Industry"; B. T. Lanphier, Carpenter Steel Co., "Stainless Steels"; W. S. Girvin, American Brass Co., "Brass and Bronze"; J. Y. Riedel, Bethlehem Steel Co., "Toolsteels"; J. B. Godshall, Ingersoll-Rand Co., "Cast Metals"; and (not shown) M. W. Dalrymple, Bethlehem Steel Co., "Alloy Constructional Steels". At right is Chapter Chairman Joseph F. Libsch of Lehigh University. (Reported by William J. Murphy, Lehigh University)

Mehl Cited for Contributions to Education

Dr. Mehl at Philadelphia

Reported by George L. Schiel
Metlab Co.

In connection with its first annual "Students' Night," Philadelphia Chapter honored Robert F. Mehl for his notable contributions to metallurgical education. A large number of students from local educational institutions participated in the program, which was designed to serve a twofold purpose—to honor leaders in the field of education and to bring together student and industry members of the Philadelphia Chapter.

Prior to the meeting, student photomicrographs were judged and awards were made. All entries were exhibited.

In presenting his lecture on "Transformations in Steel", Dr. Mehl took cognizance of the spirit of the evening and invited student discussion at any point during his lecture. Dr. Mehl covered recent data and information on the transformation of austenite to its various products of pearlite, bainite and martensite, with special emphasis on the mechanism of the transformation. Describing the formation of pearlite and bainite as a process of nucleation and growth, and the formation of martensite as a processs involving lattice shear, Dr. Mehl explained to the students—both young and old—the various factors affecting the rates of these transformations.

At the conclusion of the lecture Dr. Mehl was presented with a plaque recording the citation.

Admiral Rico Botta of the Philadelphia Naval Base spoke at dinner on the daring subject "What's Wrong With Engineers?"

Outlines World Resources In Strategic Materials

Reported by A. F. Mohri
Chief Metallurgist
Steel Co. of Canada, Ltd.

Source of supply of the lesser-known metals that are becoming increasingly important were dealt with in a talk on "Strategic Materials" before the Ontario Chapter A.S.M. on April 6. Speaker was G. C. Monture, chief of the Mineral Resources Division, Department of Mines and Technical Surveys.

Dr. Monture outlined the situation with respect to tungsten, antimony, tin, cobalt, manganese, columbium, and tantalum, describing Canada's position in relation to world resources. He also included an analysis of the geopolitical situation of the communist-dominated countries versus the free world with relation to sources of supply of the major metals and alloys.

Many Problems Seen for Future Development in High-Temperature Alloys

Reported by G. A. Colligan
Farrel-Birmingham Co.

At the Annual Sustaining Members' Night meeting of the New Haven Chapter A.S.M., "Recent Developments in High-Temperature Metallurgy" were presented and explained by Charles T. Evans, Jr., chief metallurgist for the Elliott Co. The fact that Type 316 stainless steel was the strongest high-temperature alloy prior to 1940 emphasizes the youth of this field of metallurgy. The bulk of research work was done during the war years, while the postwar period has been concerned mainly with development of previous research.

Mr. Evans divided current high-temperature alloys into three groups: (*a*) wrought superalloys, iron-base, such as 19-9DL; (*b*) wrought superalloys, nickel or cobalt-base, such as Inconel "X"; and (*c*) cast superalloys.

The British have done a great deal of work on eliminating nickel in disk materials, the speaker observed. They also have been very successful in processing of the superalloys, and their forging practices are particularly advanced. Forgings weighing 25,000 lb. are not uncommon.

Among the many problems for solution and future development work are the poor oxidation resistance of pure metals such as molybdenum, the low thermal shock properties of ceramics, and the danger of corrosion in turbines burning heavy oil.

At the present time, materials showing favorable future possibilities are stainless-clad copper, pure molybdenum, carbides, titanium, and ductile iron, Mr. Evans said.

Reviews Studies on Deep Drawing of Sheet

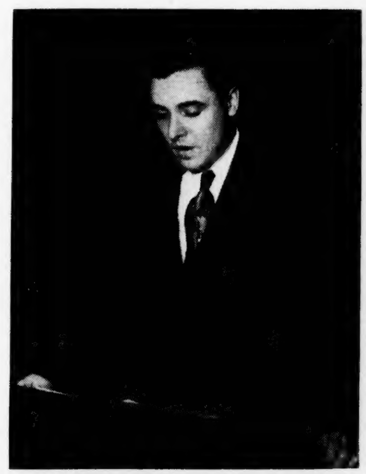
Reported by Paul L. Filter
Dow Chemical Co.

If the results of press performance are properly appraised, properties and characteristics of deep drawing steel sheets which might not have been known previously can be ascertained, William T. Lankford told the Saginaw Valley Chapter A.S.M. on April 17. Dr. Lankford, who is research associate, United States Steel Co., discussed the properties of sheets that are applicable to drawing and the variation in properties according to the type of draw.

As a specific example he cited drawing operation on automobile fenders. The critical spot, as indicated by his studies, is the headlamp area, where bi-axial stretching occurs.

The experimental work at United States Steel Co. was performed on lots of steel with a wide range of production press performance. It was discovered that cracking during a draw is not always caused by low ductility, but may be due in no small part to strain concentration.

Dr. Lankford advised that where the actual forming is performed primarily by stretching, a close study should be made of the factors which influence strain localization. Two of these factors are work hardening (which, when it occurs in certain areas, imparts strain to other areas), and the directionality of plastic properties. In symmetrical draws, this directionality can yield unfavorable results, whereas, in certain unsymmetrical draws, this directionality of plastic properties can be used to advantage.



Dr. Lankford at Saginaw

The research program discussed by Dr. Lankford is part of a continuing program of the study of plastic flow in the deep drawing process, the speaker explained.

Machining Tests Show Effect of Structure

Reported by G. A. Fisher, Jr.
International Nickel Co., Inc.

Tests made by Metcut Research Associations on machining of metals have shown a definite need for a test to show the anneability of a steel. This point was brought out by Michael Field, a partner in the firm, in addressing the St. Louis Chapter A.S.M. on May 18.

Dr. Field presented fundamental information relative to the effect of microstructures upon the machinability of cast iron as evaluated by tool life. By measuring the amount of wear on the land of the tool flank, tool life can be measured. A correlation has been found between tool land wear and tool failure, Dr. Field pointed out.

Charts in which tool life was plotted with relation to cutting speed definitely show that ferritic cast iron gives the best tool life, while those irons with coarse pearlite, fine pearlite, carbides or martensitic structure show decreasing tool life in that order.

Data and charts also indicate that the degree of machinability of cast iron of the spheroidal graphite type is comparable to that of flake-graphite iron and is dependent upon the matrix structure. However, for equivalent strength levels, the spheroidal graphite iron has an exceptional degree of machinability.

Dr. Field illustrated the various types of structures normally found in AISI 1010, 1113, 8620 and 8640 steels. The first two steels normally are ferritic, the 8620 steel is normally ferritic plus pearlitic and represents the carburizing types of steel, while the 8640 steel is primarily pearlitic plus ferritic and represents the direct hardening types. The latter types might also contain varying amounts of pearlite or be of a Widmanstaten, a spheroidized or a tempered martensite structure. Charts illustrated that each of these structures has different machinability. Likewise, for each of the structures there is a large difference in tool life between carbide and high speed tools, the latter showing greater spread in tool life for different microstructures.

A test for annealability, such as Dr. Field indicated would be desirable, should simulate a hardenability test. It was definitely shown that for steel as well as for cast iron, a very fine pearlitic structure does not have the equivalent machinability of coarse pearlite.

Finally, Dr. Field showed some data on the high-alloy materials such as Type 347 and 410 stainless steel, Inconel "X" and Timken 16-25-6. These materials likewise show a wide difference in machinability dependent upon microstructure.

At this meeting it was the privilege of the St. Louis Chapter to honor one of the older members, Wm. J. Harris, by presenting him with a gift for his long service as a projectionist for the society meetings.

Left Is Verne Pulsifer of Western Cartridge Co., Program Chairman for the St. Louis Chapter, Together With Michael Field of Metcut Research Associates, the Speaker

Yatsevitch, War Department Metallurgist, Dies at 71

Michael Gratian Yatsevitch, chief metallurgist for the War Department during the second World War, died May 10 in Schuylerville, N. Y. His age was 71.

Mr. Yatsevitch received decorations from former Secretary of War Robert Patterson and the late President Franklin D. Roosevelt for his service. After the war, he served as special advisor to the Wyser Commission in Germany. For many years he was a metallurgist at Watertown Arsenal, and was a contributor to the A.S.M. *Transactions.*

Born in Siberia, he studied in Russian technical schools and also at Leipzig and Harvard Universities. In 1913 he came to the United States to study metallurgy and allied industries and higher technical education here and in Canada. From 1916 to 1918 he was back in Russia, and then served as a consulting engineer in London from 1919 to 1926, when he received his appointment as a metallurgist at Watertown Arsenal and remained permanently in this country.

Compliments

To JAMES T. MACKENZIE, technical director of the American Cast Iron Pipe Co. and a national trustee of A.S.M., on the award of the 1951 Herty Medal sponsored by the Chemistry Club of Georgia State College for Women and administered by the American Chemical Society's Georgia Section.

♦ ♦ ♦

To C. STEWART PARSONS, director, mines branch, Department of Mines and Technical Surveys, Ottawa, Canada, on the award of the Inco Platinum Medal of the International Nickel Co., for "meritorious contribution of outstanding importance to the mining and metallurgical industry".

♦ ♦ ♦

To CLARENCE H. LORIG, assistant director, Battelle Memorial Institute, on the award of a distinguished service citation by University of Wisconsin for accomplishments in the field of metallurgical engineering.

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To H. V. CHURCHILL on his completion of 32 years of service with Aluminum Co. of America. Mr. Churchill retired on July 1 as chief of the analytical division of Alcoa's research laboratories in New Kensington, Pa.

♦ ♦ ♦

To TRUMAN S. FULLER, engineer in charge of works laboratory, General Electric Co., on his election as president of the American Society for Testing Materials.

To the following new members elected to the board of directors of A.S.T.M.: JOHN W. BOLTON, director of metallurgical research and testing, Lunkenheimer Co.; RUDOLPH A. SCHATZEL, vice-president and director of engineering, Rome Cable Corp.; and F. P. ZIMMERLI, chief engineer, Barnes-Gibson-Raymond Division of Associated Spring Corp.

♦ ♦ ♦

To D. S. CLARK and P. E. DUWEZ, professors at California Institute of Technology, on the award of the Charles B. Dudley Medal of the A.S.T.M.; to R. L. TEMPLIN and W. C. ABER of Aluminum Co. of America, on the receipt of the Richard L. Templin Award; and to C. T. EVANS, JR., Elliott Co., on the receipt of the Sam Tour Award. All three awards are made by the American Society for Testing Materials for papers of outstanding merit in various categories.

♦ ♦ ♦

To HAROLD HUDSON MORGAN, vice-president and general manager, Robert W. Hunt Co., on his election to honorary membership in the American Society for Testing Materials.

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To A. F. DAVIS, vice-president and secretary of the Lincoln Electric Co., and also secretary of the James F. Lincoln Arc Welding Foundation, on the award of the degree of D. Sc. by Mt. Union College.

Cemented Carbide Industry Attempts to Set Standards, Control Scarcities

Reported by W. Mack Crook
Consulting Engineer

H. W. Highriter, technical director of the Vascoloy Ramet Corp., speaking on "Powder Metallurgy" before the Texas Chapter on April 3, first covered the broad, general aspects and manufacturing methods, and then gave specific information on the refractory metals and the cemented carbides.

While both chemical and physical means are used for the production of metal powders, the bulk of production is by reduction of metal oxides. The importance of control to maintain purity in these processes was emphasized, for there is no scavenging effect such as in the chemical reactions of the melting processes, and the producer ends the process with the same material, pure or contaminated, as at the beginning.

In the mixing of metal powders, the ball mill method often serves a dual purpose. In the production of cemented carbides, for instance, one of the prime purposes of the ball mill is to coat the carbide particles with the cementing agent. This action, which takes place simultaneously with the pulverizing and mixing, might require several days.

Processes and equipment for molding, presintering, and final sintering were illustrated with slides, and Mr. Highriter then turned to specific aspects of parts made from the refractory materials such as tungsten, molybdenum and tantalum, and the cemented carbides.

While the pure cemented carbides are extremely hard, they are also brittle—a difficulty that is overcome to the degree required by the proper kind and amount of a ductile cementing metal such as iron, cobalt or nickel. Cobalt is by far the most widely used; in cutting tool inserts, for example, the amount of cobalt varies generally in the range of 3 to 13%, although as high as 40% is used in swaging dies.

Another variant used as a control on finished properties is the fineness of the powder. The particles may be as small as ¼ micron (10 millionths of an inch) up to a maximum size of approximately 10 microns. By proper control of the amount of cementing agent and the fineness of the powder, the desired combination of hardness and toughness may be attained.

In the first cemented tungsten carbide tools, difficulty was encountered when machining steel, through cratering, due to the welding action of steel chips cut from the work. This difficulty was overcome with tantalum carbide, which has a lower coefficient of friction and less chip welding tendency. Tantalum carbide, however, is expensive. Various combinations of carbides of tantalum, titanium and tungsten are now more economically used in tools for machining steel.

At the April Meeting of the Texas Chapter Were Dale Hjort, District Engineer for Vascoloy Ramet Corp.; H. C. Dill of Dickson Gun Plant, Vice-Chairman and Chairman-Elect of the Chapter; H. W. Highriter, Technical Director, Vascoloy Ramet Corp., the Speaker; and Harold Schmid of General Metals Corp., Current Chairman. (Photo by Leland V. Dolan)

Progress is being made in standardizing grades of cemented carbides being produced. These standards are difficult to set, for the industry is too new and the problem is complex.

The price of the raw materials has increased tremendously from what it was only several years ago. This is largely the result of scarcity caused by loss of the Chinese and Korean ore supplies.

The demand for cemented carbides in armor-piercing ammunition is great. This demand by the armed forces has to be balanced against other items needed in the country's defense. Realization of this has led to a modification for the demand in ammunition to such an extent that enough cutting tools should be available for the present tooling program.

Mahoning Valley Members Observe Operations of Mechanized Steel Foundry

Reported by J. G. Cutton
Metallurgist, United States Steel Co.

On May 8 a large delegation from the Mahoning Valley Chapter A. S. M. visited the Sharon Works of the National Malleable and Steel Castings Co. Most of those present were unfamiliar with the operation of a mechanized steel foundry, and they welcomed the opportunity to inspect such a shop.

Among the items of greatest interest to the group was the production of anchor chain such as was used in great quantity on the Victory and Liberty ships during the last war. The chain is produced by first casting single "precast" links. These links are then set horizontally in dry sand cores and the connecting links are cast at right angles so that a continuous shot of chain is produced.

The principal production of this shop goes to railroad work, and the visitors saw sideframes and bolsters for railroad trucks and couplers for freight cars being turned out on a production basis.

The sand for this production is mulled in a battery of mullers that condition over 16,000,000 lb. of sand a week, it is then delivered by conveyors to the molding stations. A large sandslinger for molding the sideframes and bolsters throws the sand into the mold at a velocity of over 100 miles per hr.

The production of the cope and drag half of the molds, the green sand cores and the core setting are all carefully synchronized so as to minimize lost time and waste effort.

The six melting units are all electric furnaces, which are producing 9-ton heats at present with a power consumption of more than 5,000,000 kw-hr. per month.

Molding, pouring, shakeout, heat treatment and finishing operations are all on a mechanized basis with handling minimized and with the production flowing in a straight line as far as possible.

This highly interesting trip was arranged and conducted by H. H. Johnson, chief metallurgist of National Malleable and Steel Castings Co., and chairman of the chapter.

Lecture Supplements Pictorial Story of Aircraft Forgings

Present at Philadelphia Chapter's April Meeting Were Frank Tatnall, Entertainment Chairman; Claire C. Balke, Program Chairman; A. L. Rustay of Wyman Gordon Co., Speaker of the Evening on "Aircraft Forgings"; F. J. Trembly of Lehigh University, Coffee Speaker; Joseph Gray Jackson, Chapter Chairman; A. M. Bounds, Chairman of the Educational Committee; and Russell McCarron, Chapter Vice-Chairman

Reported by George L. Schiel
Metlab Co.

Speaking before an appreciative audience at the April meeting of the Philadelphia Chapter, A. L. Rustay of the Wyman Gordan Co., Worcester, Mass., showed motion pictures and slides of various stages in the manufacture of aircraft forgings. The talk and illustrations traced operations, from the calculation of the original billet size, through die design and manufacture, and finally the actual forging of the part.

The first motion picture with sound showed all stages in the fabrication of an aluminum turbine rotor from the first upsetting operation through the rough machining and heat treating. The forging of a large airframe part was also described.

The second film dealt with forging of various steel shapes in both small and large presses. Mr. Rustay then showed slides of typical forgings and offered comments concerning each.

Following the formal presentation an active discussion took place with particular interest shown by the audience in very large presses, the forging of titanium and magnesium, and residual stresses in materials after forging.

Professor F. J. Trembly of Lehigh University spoke at dinner on the "Evolution of Man".

Gives New Concepts of Fatigue

Reported by Knox A. Powell
Research Engineer
Minneapolis-Moline Co.

John O. Almen, widely known research consultant for General Motors, gave his illustrated talk on "New Concepts of Fatigue of Metals and Brittle Failures" before the Northwest Chapter A.S.M. at its regular monthly meeting on May 17. Mr. Almen's talk has been reported in previous issues of *Metals Review*.

5-Million-Volt Generator Seen in Atomic Power Lab at B.C. University

Reported by W. Galt
Plant Superintendent
Canadian Sumner Iron Works, Ltd.

University of British Columbia, overlooking the golden shores of Burrard Inlet and shadowed by the Twin Peaks of the Lions which guard Vancouver Harbor, provided a magnificent setting for the April meeting of the British Columbia Chapter A.S.M. The dinner was held in the Faculty Club with Prof. W. M. Armstrong presiding. The meeting was held jointly with the American Foundrymen's Society, whose chairman, P. Lovick Young, brought greetings.

The gathering then adjourned to the new Physics Buiding, where Kenneth C. Mann delivered a lecture on atomic energy. In addition to his work at the University, Dr. Mann has spent some time in the Chalk River Atomic Energy Project.

Dr. Mann outlined a few of the fundamentals of atomic theory, giving his audience a better understanding of the principles behind atomic fission and atomic power. Tremendous forces are required to initiate the desired reaction, and research scientists are now building machines capable of producing potentials up to a thousand million volts.

After the lecture Dr. Mann demonstrated the machine being assembled at the University. This is a Van-de-Graaf generator which will probably reach about 5,000,000 volts. Local manufacturers, Dr. Mann said, fabricated most of the component parts going into this massive generator.

A Geiger counter in operation and a cloud chamber used in atomic research were also inspected.

One of the highlights of the evening was a discussion of peaceful uses of atomic energy. Radioactive tracers produced in atomic piles are already being used to aid researchers in medical, industrial and agricultural fields.

Don Beach, Organizer of Georgia Chapter, Dies

Donald D. Beach, a past chairman and one of the organizers of the Georgia Chapter of the American Society for Metals, died at his home in Atlanta on April 29 after an illness of several months. Mr. Beach, who was 48, was industrial sales manager for Atlanta Gas Light Co.

A native of Ottawa, Ohio, he attended Ohio State University and had been connected with the gas industry for more than 20 years. Before joining Atlanta Gas Light Co. in 1930 as industrial engineer, he was district engineer for the Ohio Fuel Gas Co. at Columbus, Ohio. He became industrial sales manager for Atlanta Gas Light Co. in 1941.

At the time of his death, Mr. Beach was chairman of the Ethics and Practice Committee of the Georgia Chapter of the Society of Professional Engineers.

Clarence W. Pierce

Clarence W. Pierce, chairman of the board of directors of Modern Bond Corp. in Wilmington, Del., died May 21 at the age of 73. Mr. Pierce was one of the founders of the corporation, which builds special machinery for large industrial concerns.

Mr. Pierce learned the trade of machinist with F. F. Slocomb and Co., and after experience with Harlan and Hollingsworth Corp. and Victor Talking Machine Co., he helped found Modern Machinery Co. in 1904 and served as secretary. In 1926 he became vice-president and in 1942 president. He acted in that capacity until last March, when he was elected chairman of the board.

Alloying Additions To Steel Treated From Two Aspects

Reported by E. J. Turner
Boeing Airplane Co.

"Effects of Alloying Additions to Steel" were treated from two aspects by H. P. Rassbach, metallurgical engineer with the Electro Metallurgical Co., a division of Union Carbide and Carbon Corp., speaking before the April meeting of the Puget Sound Chapter A.S.M.

Mr. Rassbach devoted the first part of his talk to the function of alloys in steel making, including a brief review of recent research on deoxidation done by Crafts and Hilty of Union Carbide. Curves from their work on the solubility of oxygen in iron show how substantial quality improvement may be obtained by the use of combination deoxidizers such as silicomanganese. The roll of other deoxidizers such as calcium, vanadium, and zirconium in the production of clean, special-purpose steels was covered. Calcium as a calcium-manganese-silicon alloy and as a calcium-silicon alloy is widely used to produce steels in which cleanliness is of critical importance.

Inclusions become larger as the rate of cooling is decreased, Mr. Rassbach showed. Step deoxidation procedures are effective in combatting the excessive formation of inclusions in steels which are inherently high in oxygen because of their carbon content. The dangers of hydrogen flakes in heavy alloy sections were illustrated.

In the second part of his talk the speaker covered the effect of alloying elements on hardenability and physical properties. The maximum quenched hardness of any ferritic steel, the speaker said, is dependent almost entirely upon its carbon content, and alloys are used to get high strength in heavy sections. Chromium is widely used in the constructional alloy steels, principally because it is the lowest cost alloying agent for improving hardenability. Likewise, it has a wide variety of favorable influences such as improving wear and corrosion resistance.

Hardenability curves were shown to illustrate the advantages of using a combination of two or three alloys to develop properties not realized when the same elements are used singly.

Turning to the use and effect of boron as an alloying element, Mr. Rassbach pointed out that precautions in deoxidation procedure are necessary. Generally, more effective results are obtained when an alloy is used in which the boron content is small and it is surrounded by other protective deoxidizers such as silicon, calcium, aluminum, zirconium and titanium. The influence of boron is not very effective unless the piece is of such size that it may be quenched to at least 50% martensite.

A brief review was presented of the various types of stainless steels and their alloy content. Resistance to sensitization of the austenitic steels (18-8) may be controlled either by lowering the carbon in the steel to less than 0.03% or by "tying up" the carbon with some alloy such as columbium, tantalum or titanium. However, since the element columbium is of critical importance in high-temperature applications in the aircraft industry, little is available for nonaircraft use. Likewise, it is difficult to produce 18-8 steels with extremely low carbon content because of the great affinity that chromium has for carbon. To improve this situation, Electro Metallurgical Co. has developed a new chromium alloy with an extremely low carbon content (0.025% max.). This material, soon commercially available, will go far to improve our present critical supply situation on steels which must be resistant to intergranular attack. The extra-low-carbon grade of 18-8 is also useful in mild heat resistant applications, and possesses strength comparable to Type 347 up to 800° F.

An interesting sidelight on nitrogen is its ability to form austenite. At the present time, advantage is taken of this fact to conserve nickel in the production of austenitic stainless steels. The addition of some manganese and nitrogen can save as much as 2 to 3% nickel. Such steels have excellent strength for structural purposes.

The recommended maximum nitrogen content is 0.10%. Although some manufacturers are successful in using 0.15%, there is some danger of gassy heats above this amount. A ferrochromium alloy containing nitrogen may be used to make the addition.

Gives ABC's of Heat Resistant Alloys

A Review of the Fundamental Requirements of the Heat Resisting Alloys Was Presented at St. Louis by C. Roger Sutton (Left), Senior Metallurgist of Argonne National Laboratory. Next to Mr. Sutton are C. W. Messinger, chapter chairman, and Verne Pulsifer, vice-chairman

Reported by G. A. Fisher, Jr.
International Nickel Co., Inc.

The three fundamental requirements of heat resistant alloys are to withstand stress at elevated temperatures, to have sufficient oxidation resistance and to show minimum phase change. These requirements were elaborated upon at the April 20th meeting of the St. Louis Chapter of A.S.M. by C. Roger Sutton, senior metallurgist, Argonne National Laboratory. His talk was entitled "ABC's and IOU's of Heat Resisting Alloys".

Alloys of iron with at least 25% chromium are capable of meeting most of these requirements. Mr. Sutton further pointed out that nickel, molybdenum, aluminum and other alloys are added to the chromium-iron alloys to improve serviceability.

Various factors affect the stability, strength and oxidation resistance of the chromium-nickel and nickel-chromium types of heat resistant alloys.

The higher chromium types with lower nickel content are subject to sigma phase changes and form carbides in the grain boundaries. Likewise, alloys with a higher nickel content may also form the sigma phase. The higher nickel, lower chromium alloys of the 38-15 Ni-Cr types, and alloys with higher nickel content, normally show good to excellent oxidation resistance, good strength at elevated temperatures and high stability with respect to phase change.

Mr. Sutton stated that thermal stresses cause most of the failures in heat treating equipment and pointed out the necessity for adequate and proper design of fixtures.

The ABC's of heat resistant alloys, Mr. Sutton said, are the effects of various compositions on the properties of the alloys. The IOU's designate the need for proper design, such as generous fillets and lack of stress raisers, as indicated particularly by the contour of the letter "O" and the letter "U".

Significant Advances Made in Research In Light Metals Field

Reported by G. A. Stemple
Consolidated Gas, Electric, Light & Power Co.

The aluminum industry has come a long way since Napoleon III ordered 440 lb. of aluminum at $17 per lb. for manufacturing 217 eagles which tipped the French flag. At the present time aluminum ingot sells for 18¢ per lb., E. S. Bunn, metallurgical manager, aluminum division, Revere Copper and Brass, Inc., pointed out in addressing the Baltimore Chapter A.S.M. His topic was "Working With Aluminum."

In this country the biggest bite of primary metal is taken by wrought products—75 to 80% of total production. Production of most of these items has increased to over 20 times what it was before the war.

Mr. Bunn lauded research progress in the light metal field and pointed out numerous developments. Most notable of these is probably the 75S alloy (magnesium-zinc containing minor amounts of copper and chromium). It is capable of being fabricated in wrought forms and can be heat treated and aged to develop properties not possible with any other aluminum alloy.

Significant advances have been made in recent years in the working of aluminum alloys. Examples are hollow extrusions containing up to five and six completely enclosed hollow areas, and heat exchanger tubes containing both internal and external fins integral with the tube. These are intermediate to large-diameter relatively light-walled tubes and are made by use of floating mandrels or porthole or spider-type dies.

One of the recent improvements in protective finishes, according to Mr. Bunn, is the R-5 process of the Aluminum Co. of America, comparable to that of Kaiser and others, which imparts a bright luster. This dip, operated hot, consists of a mixture of phosphoric, nitric and glacial acetic acids which remove relatively little metal. A clear lacquer or anodic coat maintains the finish. Another is the Martin process for producing thick coatings for wear and abrasion resistance. New waxes developed by S. C. Johnson have withstood 300 hr. of 20% salt spray.

Welding of aluminum parts with the automatic shielded metal-arc consumable-electrode process, using an aluminum filler wire, costs 25 to 50% less than with the inert-gas tungsten-arc welding, and produces higher mechanical properties than can be obtained by other welding methods.

The coffee speaker of the evening was Admiral William H. Brockman, U. S. N. Retired, who related some of his experiences as commander of the submarine Nautilus during World War II.

Hosts at Simonds Saw & Steel

Pictured Above Are Five Members of the Simonds Saw & Steel Co. Organization Who Were Hosts to the Worcester Chapter A.S.M. at an Afternoon Plant Inspection in April. They are J. Donald McCready, George T. Keyes, Percy U. Feyler, Roger Tuttle and Walter E. Lamlein. Following dinner a film on saws was shown, and new officers were elected. (Reported by C. Weston Russell, Wyman-Gordon Co.)

Electronic Inspection Finds Defects and Cracks in Large Forgings and Billets

Reported by Arthur C. Willis
Magnaflux Corp.

"Electronic Inspection of Metals", particularly as applied to large forgings, was the subject of a joint meeting of the North Texas Chapter A.S.M. and the American Society of Mechanical Engineers on April 17. The speaker was E. O. Dixon, vice-president in charge of research and metallurgy for the Ladish Co.

As background for his primary topic, Mr. Dixon gave a review of forging practice. Large forgings—made from ingots weighing up to 700,000 lb., and weighing up to 500,000 lb. as forged—require the use of open dies, on presses exerting forces up to 25,000 tons. A larger press, capable of force to 35,000 tons, existed in Germany but has been shipped to Russia.

Smaller forgings made from billets may be produced by drop forging or press forging in either open or closed dies. A special German press (now in the U. S.) was mentioned, in which the upper and lower dies move toward each other, in contrast to the conventional press with stationary lower die.

After some discussion of the collateral equipment required in a forge shop, such as trimming presses and heat treating furnaces, Mr. Dixon cited figures on the beneficial effects of forging on strength and ductility, especially in closed dies.

He then described briefly the basic method of electronic testing. A crystal elongates and contracts while high-frequency alternating current (2½ to 5 million cycles per sec.) is passed through it, he explained. The face of the crystal is held against a metal surface, good contact being assured by a film of oil or glycerine. This produces ultrasonic vibrations in the metal, which are reflected by the opposite surface of the metal object, or by any crack roughly perpendicular to the path of the impulses. These reflections, picked up by a receiver and projected onto an oscilloscope, produce traces that can be readily interpreted as to location and nature of the reflecting surface.

The method is well-adapted to the inspection of large forgings and billets; clear indications have been obtained from cracks 32 ft. from the crystal.

Avery Speaks at Springfield

Reported by Howard E. Boyer
Chief Metallurgist
American Bosch Corp.

"Abrasion Resistant Alloys" formed the subject of the meeting held on May 20 by the Springfield Chapter A.S.M., with Howard S. Avery of the metallurgical department, American Brake Shoe Co., presenting this technical discussion. Details of Mr. Avery's talk were published in the March 1951 issue of *Metals Review*, page 16.

The meeting was held at the Sheraton Hotel in Springfield, Mass., following a dinner and a brief business meeting at which officers were elected for the coming season.

U.S. Steel Geologist Clarifies Situation in Iron Ore Resources

Reported by J. W. Poynter
Metallurgist, Wright Patterson Air Force Base

The present situation facing the steel industry in the matter of iron ore resources is not an actual shortage of ore, according to H. C. Burrell, raw materials geologist of the United States Steel Co. Rather the difficulties are associated with the change in the sources and kinds of iron ore, Dr. Burrell maintained in addressing the Dayton Chapter A.S.M. on May 9.

Many of these difficulties are economic rather than technological. Dr. Burrell stressed that the progress made in the beneficiation of the taconite ores is just as important as the discovery of the Venezuelan ore deposits and should not be lost sight of.

The taconite ores are very hard and must be crushed very fine before they can be concentrated and sintered. The electromagnetic separation process shows much promise, Dr. Burrell observed. Even though the crushing and concentrating operations are expensive, the resulting sinter is as good if not better than the direct-shipping Mesabi natural ores.

The story of the discovery of the Cerro Bolivar ore mountain in Venezuela was then told. Preliminary surveys were made using some old aerial photographs of the region made by the U. S. Air Force in practice as a guide. Based on the findings, a detailed aerial survey was made of 10,500 sq. miles. While the area is not considered large in petroleum circles, it is believed to be largest area ever surveyed in iron ore searches. These photographs indicated the possible deposit on the Cerro Bolivar mountain, and when a quick ground survey confirmed this possibility, the claim was staked.

Dr. Burrell, who had a prominent part in this discovery, enlightened his audience with many incidents from his personal experience.

Statistical Quality Control Usage Gathers Momentum

Reported by R. J. Wagner
Gary Screw & Bolt Div.

The statistical method of quality control is gathering momentum in usage throughout the industrial world, said Leon Nelson of Republic Steel Corp., addressing the Calumet Chapter A.S.M. on May 8. Mr. Nelson used many slides and graphs to show work that has been done in steel mills using this method.

All figures must be available for all variables, he emphasized. They must also be correctly analyzed, using mathematical formulas. The resultant reports are in the form of picture charts, which are usually easier to understand than a written report.

Using these formulas, quality control engineers can take data from short runs and calculate the probability of errors or defects for a long period of time. This has been proven by making several short studies with a long time interval between. They checked very close to the calculated probability. The subject can become very complicated if not controlled from a common-sense angle, the speaker warned.

Mr. Nelson predicted that the Army, Navy and Air Force will eventually require quality control records before awarding contracts. Such statistical records would enable them to determine the amount of inspection they must put into the plant.

Construction Starts on New Lab

Battelle Memorial Institute, Columbus, Ohio, has begun construction on a new million-dollar laboratory building. The new building (fifth in the past decade) will provide approximately 80,000 sq. ft. of work area and will house 115 unit laboratories. It is expected that it will allow a 15 to 20% increase in Battelle research services.

A. S. M. Review of Current Metal Literature

An Annotated Survey of Engineering, Scientific and Industrial Journals and Books Here and Abroad, Received During the Past Month

Prepared in the Library of Battelle Memorial Institute, Columbus, Ohio

W. W. Howell, Technical Abstractor

Assisted by Mary Lee Mote, N. W. Baklanoff, Fred Rothfuss, and Leila M. Virtue

A GENERAL METALLURGICAL

176-A. Some Principal Sources of Gold and Silver. David N. Skillings. *Skillings' Mining Review,* v. 40, May 26, 1951, p. 1, 4.

Includes tabulation of outputs of 32 companies. (A4, Au, Ag)

177-A. Recovery of Sulfurous Gases Formed During Smelting of Copper Ores. (In Italian.) Edmondo Schmidt di Fridberg. *Metallurgia Italiana,* v. 42, Dec. 1950, p. 473-478.

In particular the amount of SO_2 which may be recovered from converters. Flow sheet of proposed installation. Economic aspects. (A8, C21, Cu)

178-A. The Great Aluminum Farce. *Fortune,* v. 18, June 1951, p. 92-98, 176, 179, 181-182, 184.

Political and economic aspects of the present Al shortage, and the Al industry's expansion to overcome it. Advantages of buying Al from Canada, instead of attempting to produce it all in the U. S. at higher cost. (A-4, Al)

179-A. Disposal of Plating Room Wastes. III. Cyanide Wastes: Treatment With Hypochlorites and Removal of Cyanates. Barnett F. Dodge and Walter Zabban. *Plating,* v. 38, June 1951, p. 561-566, 571-586.

Experimental work on three treatment processes that appear to be the most promising. Oxidation by hypochlorite ion is the best known and most widely practiced of the methods. 19 ref. (A8, L17)

180-A. Metallurgical Laboratories Harold K. Work. "Laboratory Design" (Reinhold Publishing Corp., New York), 1951, p. 191-194.

Recommended design and facilities. General features, metallographic equipment, mechanical testing equipment, melting facilities, heat treating facilities, shaping of metals, miscellaneous allied laboratories, and layout. (A9)

181-A. Rank of L. S. Iron Ore Producers in 1950. *Skillings' Mining Review,* v. 90, June 2, 1951, p. 1, 7.

Data on tonnage of shipments made by 24 operating companies from 171 mines. (A4, Fe)

182-A. Grades of Iron Ore Shipped from L. S. Region, 1950. David N. Skillings. *Skillings' Mining Review,* v. 40, June 9, 1951, p. 1, 4, 15.

Tonnages and average analyses for the various U. S. and Canadian ranges. (A4, B10, Fe)

183-A. First Exploratory Effort in World Metallurgy. A. H. Allen. *Steel,* v. 128, June 11, 1951, p. 76-77, 104.

Plans for World Metallurgical Congress to be held in Detroit, Oct. 15-19, 1951. Technologists, scientists, production executives and sales engineers in producing and fabricating industries will join in a global conference to examine conservation, utilization and substitution of strategic metals; to share scientific knowledge, technical and business skills. (A3)

184-A. Thirty-first Annual Report, *British Non-Ferrous Metals Research Association,* Apr. 1951, 64 pages.

Includes review of research progress. (A9, EG-a)

185-A. Spanish Iron and Steel Industry. *Foundry Trade Journal,* v. 90, May 24, 1951, p. 559.

Present and future prospects. (A4, Fe, ST)

186-A. The Yugoslavian Aluminum Industry. (In French.) G. A. Baudart. *Revue de l'Aluminium,* v. 28, Apr. 1951, p. 121-122.

Recent development and future plans. (A4, Al)

The coding symbols at the end of the abstracts refer to the ASM-SLA Metallurgical Literature Classification. For details write to the American Society for Metals, 7301 Euclid Ave., Cleveland 3, Ohio.

187-A. Review of Iron and Steel Literature for 1950. Morris Schrero. *Blast Furnace and Steel Plant,* v. 39, June 1951, p. 688-690, 731.

34th annual review attempts to list books and pamphlets published during 1950, with some of earlier date not included in the previous review. (A10)

188-A. Recent Developments in Casting Alloys. *Chemical Age,* v. 64, June 2, 1951, p. 849-850.

British reluctance to adopt new methods. (A5)

189-A. More Tonnage for Titanium. *Chemical Week,* v. 68, June 16, 1951, p. 14-15.

Entry of Crane Co. into the Ti-production business. Its ton-a-week goal will rival the 1950 production (60 tons) of DuPont and National Lead. But they will turn out 500 tons this year, will hit a rate of 5,000 tons by end of 1952. Properties, processes, and future outlook. (A4, Ti)

190-A. A Method for Disposal of Acid and Alkaline Plating Room Wastes. J. H. Monaweck and Clyde Kelly. *Products Finishing,* v. 15, June 1951, p. 38, 40.

Mixing procedure. (A8, L17)

191-A. Where We Stand on Strategic Materials: Nonferrous Materials. *SAE Journal,* v. 59, June 1951, p. 18, 21-24 (Excerpts from "Where Do We Stand on Nonferrous Strategic Materials?" by Richard J. Lund.)

Highlights of the supply-demand picture, stockpiling, controls, foreign developments, and future prospects for Cu, Pb, Zn, Al, Sn, Co, Cd, and diamonds. (A4, Cu, Pb, Zn, Al, Sn, Co, Cd, C-b)

192-A. Where We Stand on Strategic Materials: Ferrous Metals. *SAE Journal,* v. 59, June 1951, p. 19-21 (Based on "Status of Ferrous Strategic Materials—Government and Industry Situation and Rulings," by E. C. Smith.)

Economic analysis of present status and future prospects for ferrous materials in the U. S. Includes analysis of the alloying-element situation, specifically for Mn, Cb, V, Mo, Ti, W, Cr, Ni, and Co. (A4, Fe, ST)

193-A. Design and Research Centre for the Gold, Silver and Jewellery Industries; An Experiment in Cooperative Industrial Development. G. E. Gardam. *Research,* v. 4, June 1951, p. 274-279.

Facilities and some of the work of a British organization. (A9, T9, Ag, Au)

194-A. (Book). **The Story of Metals.** John W. W. Sullivan. 290 pages. 1951. American Society for Metals, 7301 Euclid Ave., Cleveland 3, Ohio; and Iowa State College Press, Ames, Iowa. $3.00.

One of a "Series for Self-Education." Progress of metal discovery and treatment from the Stone Age to modern times. Modern industrial treatment for the more common metals. Includes discussion on the origin of the earth and formation of mineral deposits, and a final, speculative chapter on future uses of metals. (A2, B general, C general, D general)

195-A (Book) **World Resources and Industries.** Rev. Ed. Erich W. Zimmerman. 832 pages. 1951. Harper & Bros., New York.

A comprehensive appraisal including an introduction to the study of resources such as food, fibres, trees, crops, minerals, ores, coal, petroleum and gas. Includes discussion on the iron and steel industry and other metal industries, and nonmetallic and chemical industries. Extensive chapter bibliographies. (A4, B10)

196-A (Book). **Laboratory Design.** H. S. Coleman, editor. 393 pages. 1951. Reinhold Publishing Corp., 330 West 42nd St., New York.

A National Research Council report on design, construction, and equipment of laboratories. Consists of 42 papers grouped under the broad headings: materials, facilities, services, and equipment; teaching laboratories; industrial laboratories; and some modern laboratories. One of the latter group is a description by W. A. Welcker of the research buildings of Battelle Memorial Institute. Also includes a brief bibliography and an index. One paper of metallurgical interest is abstracted separately. (A9)

B

RAW MATERIALS AND ORE PREPARATION

159-B. Iron-Ore Beneficiation—Present Practices and Trends. *Iron and Steel Engineer,* v. 28, May 1951, p. 66. (Condensed from paper by Stephen E. Erickson.)
(B14, Fe)

160-B. Studies in Cassiterite Flotation. *Bulletin of the Institution of Mining and Metallurgy,* May 1951; *Transactions,* v. 60, pt. 8, 1950-51, p. 341-351.
Discusses above paper by E. J. Pryor and S. A. Wrobel (Mar. 1951 issue; see item 96-B). (B14, Sn)

161-B. Concentration of Tin Ore From the Wild Cherry and Crystal Quarries, Ardlethan, N.S.W. K. Blaskett and H. H. Dunkin. *Commonwealth Scientific and Industrial Research Organization and Mining Dept., University of Melbourne,* Investigation 394, Aug. 24, 1950, 15 pages.
General problems involved in investigating gravity concentration and the general plan followed in the experimental work. Details of preliminary tests to determine necessary degree of crushing. Results of detailed tests. Work included gravity, magnetic, and electrostatic concentration. (B14, Sn)

162-B. Chromite Investigations. Part I. A Critical Review of Methods of Utilization With Special Reference to Transvaal Ores. I. H. Kahn and A. M. Schady. *Journal of the Chemical, Metallurgical & Mining Society of South Africa,* v. 51, Feb. 1951, p. 247-256; disc., p. 256-260.
Uses of chromite, characteristics of the Transvaal ores, and possible methods of processing them. 35 ref. (B10, Cr)

163-B. Significance and Sources of the Element Fluorine in Basic Bessemer Slags. (In German.) Siegfried Gericke and Bruno Kurmies. *Stahl und Eisen,* v. 71, Apr. 26, 1951, p. 454-457.
Tests show that the F content of basic slag is on the average 0.008% and hardly ever exceeds 0.020% and that F affects the solubility of P_2O_5 only when it exceeds 0.030%. High SiO_2 and low F contents insure high solubility of P_2O_5. Graphs and tables summarize experimental results. (B21, D3, ST)

164-B. Recent and Prospective Sinter Plant Improvements. A. A. Nilsen. *American Iron and Steel Institute,* Preprint, 1951, 13 pages.
Recent development in equipment and procedures for preparation of blast-furnace sinter. Prospective or suggested improvements. (B16, Fe)

165-B. Fundamental Investigation of Steel Plant Refractories Problems. I. Phase Relations in the System 2CaO SiO_2-CaO·SiO_2-2CaO·Al_2O_3·SiO_2-FeO. Arnulf Muan and E. F. Osborn.*American Iron and Steel Institute,* Preprint, 1951, 35 pages.
Includes phase diagrams, graphs, and tables. (B19, D general, ST)

166-B. Metallurgy of Cobalt Production from Cupriferous Pyrite. Sanai Nakabe. *Journal of Metals,* v. 3, June, 1951; *Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 191, 1951, p. 445-451.
Process operated for two years at the Besshi mine and smelter (Japanese) on extremely low grade (0.1% Co) pyrite concentrates obtained from Cu ore. Steps in the process were roasting, leaching, precipitation, reduction fusion to crude Co, and finally refining by electrolysis to over 99% purity. (B14, C23, Co)

167-B. Russia's Mineral Potential, Paul M. Tyler. *Mining Engineering,* v. 3, June 1951, p. 494-497.
A critical evaluation. (B10, A4)

168-B. Leucopyrite Flotation. (In German.) Werner Grunder. *Zeitschrift fur Erzbergbau und Metallhuttenwesen,* v.4, May 1951, p. 182-185.
Design and operation of a new leucopyrite flotation plant. Results and costs of the flotation reagents. Includes flow diagrams. (B14, As)

169-B. Determination of the Mechanism of Setting of Quartzite Refractory Linings for Metallurgical Furnaces. (In Italian.) A. Palazzi and F. Savioli. *Metallurgia Italiana,* v. 42, Nov. 1950, p. 410-417.
Recommendations for procedures to obtain optimum results. Hypothesis concerning the mechanism of setting. 12 ref. (B19)

170-B. Metallurgical Treatment of Some Oxidized Antimony Ores. (In Italian.) Pietro Principato. *Metallurgia Italiana,* v. 43, Jan. 1951, p. 17-19.
How a plant, built for the treatment of stibnite, may also be economically designed for treatment of oxidized minerals in general (valentinite, cervantite, etc.) and particularly hydroromeitite, etc. (B14, Sb)

171-B. Victory or Stalemate? Minerals Can Decide. Evan Just. *Engineering and Mining Journal,* v. 152, June 1951, p. 80-84.
Analysis of effects of mineral resources position on a possible war with Russia and her satellites indicates that mineral resources of either the Western Hemisphere or the Soviet sphere are adequate for a resolute defense. However, it is believed that the Communists would have to acquire most of the resources of the rest of the world in order to "pack a knockout punch". (B10)

172-B. How to Simplify Testing for Sink-Float Separation. Stephen E. Erickson. *Engineering and Mining Journal,* v. 152, June 1951, p. 88-89.
Accurate, easily handled new device for testing ores or checking sink-float plant operation. (B14)

173-B. A Promising Lead-Zinc District Awaits Development. Hans Fritzsche. *Engineering and Mining Journal,* v. 152, June 1951, p. 96-101.
German district said to have 30 million tons of 6% ore in sight. Geology, mineralization, mining methods, and concentration flowsheet. (B14, Pb, Zn)

174-B. How the Metalworking Industry Uses LP Gas. Oliver Johnson. *Iron Age,* v. 167, June 14, 1951, p. 96-98.
Survey discloses that the metalworking industry is a fairly substantial user of liquefied petroleum gas. Types of plants which buy it, processes in which they use it, and where they are located. (B18)

175-B. A Calorimetric Method for Studying Grinding in a Tumbling Medium. A. Kenneth Schellinger. *Mining Engineering,* v. 3, June 1951; *Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 190, 1951, p. 518-522.
Apparatus and procedure. The grinding process may be studied on the basis of heat liberated. Preliminary results for quartz sand. (B 13)

176-B. Beaker Flotation as a Quantitative Tool in Flotation Testing. William Loblowitz. *Mining Engineering,* v. 3, June 1951; *Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 190, 1951, p. 522-523.
Simplified system of flotation testing developed recently at the Bureau of Mineral Research of Rutgers University. (B 14)

177-B. Approximation of the Energy Efficiencies of Commercial Ball Mills by the Energy Balance Methods. A. Kenneth Schellinger and Rustam D. Lalkaka. *Mining Eningeering,* v. 3, June 1951; *Transactions of the American Institute of Mining and Metllurgical Engineers,* v. 190, 1951, p. 523-524.
Application of method to two commercial ball mills while grinding cement raw materials. (B13)

178-B. Screening and Charging Practice Increases Furnace Yield. A. H. Fosdick. *Steel,* v. 128, June 18, 1951, p. 86, 88, 92, 96.
Effective procedures followed by Bethlehem Steel Co. in splitting iron ores to plus 1-in. lump and ⅜-in. nut, running the fines through the sintering plant, and charging each size in the blast furnaces separately. (B16, D1, Ce)

C

NONFERROUS EXTRACTION AND REFINING

66-C. Smelting Complex Lead Materials. C. C. Downe. *Mining Journal,* v. 236, May 11, 1951, p. 455-456.
Improved electrostatic system, which greatly reduces space requirements. Behavior of lead under different conditions, and separation of Pt metals from rich leads.
(C21, Pb)

67-C. Active Intermediates in Chemical Reactions. Hydrogen Overvoltage-Crystal Growth. G. H. Turner. *Research,* v. 4, May 1951, p. 246-247.
Study of the effects of impurity elements in electrode and crystallization reactions has led to the conclusion that free radicals are present during many electrochemical reactions, and that they may profoundly affect consecutive major reactions. Investigations have been related to the activity of a number of minor elements in the electrolytic hydrogen and Zn processes. Lowering of current efficiency in the electrodeposition of Zn (electrolytic Zn process) due to such impurities as Ge and Sb is attributed to lowering of hydrogen overvoltage on a Zn surface caused by these impurities. (C23, Zn)

68-C. The Evaporation of Aluminum in Form of Aluminum Monofluoride. (In German.) Armin Schneider and Werner Schmidt. *Zeitschrift für Metallkunde,* v. 42, Feb. 1951, p. 43-54.
Conditions required to separate metallic Al from alloys of Cu, Si, and Fe+Mn by vaporizing the Al in form of AlF. Salt mixtures that can be used to fuse the Al powder into the regulus (impure bulk metal). Experiments on the development of salt mixtures for use in either of the two operations. 20 ref.
(C28, Al)

69-C. Relationships Between Germanium and Cadmium in the Electrolysis of Zinc Sulphate Solutions. S. T. Ross and J. L. Bray. *Journal of Metals,* v. 3, June 1951; *Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 191, 1951, p. 465-467.
Electrometallurgical data on the problem of Ge removal from $ZnSO_4$ solutions. Confirmatory evidence of interaction between Ge and Cd is presented. Statistical analysis of the data is used to expand its significance and enhance its value. Further research is outlined. (C23, Zn)

70-C. Electric Furnace Melting of Copper at Baltimore. Peter R. Drummond. *Journal of Metals,* v. 3, June 1951;

Transactions of the American Institute of Mining and Metallurgical Engineers, v. 191, 1951, p. 468-472.

The furnace, the refractories, auxiliary equipment, operating procedure, and performance. Product is used to cast billets. (C21, Cu)

71-C. Surface Tension of a Molten Cryolite Bath. (In Italian.) A. Vajna. *Aluminio,* v. 20, No. 1, 1951, p. 29-38.

Results of measurements explain certain characteristic phenomena observed in electrolytic cells on an industrial scale and apparently caused by surface tension of phases in contact, particularly at the anode. (C23, P10, Al)

72-C. Gases in Electrolytic Nickel. E. Sh. Ioffe and A. L. Rotinyan *Doklady Akadamii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 77, Mar. 1, 1951, p.91-92.

A theory of the process of inclusion of certain gases (H_2, O_2, CO, or CO_2) in electrolytic Ni is based on the assumption that a certain proportion of the gas content which can be determined by usual methods is present in the form of organic compounds of Ni, during electrolysis and always present in electrolyte. (C23, Ni)

73-C. Influence of Geometric Parameters of Electrolysis Apparatus on Distribution Within Them of Electrical Energy. (In Russian.) V. P. Mashovets, N. V. Pototskaya, N. L. Komarov, and U. F. Turomshina. *Zhurnal Prikladnoi Khimii* (Journal of Applied Physics). v. 24, Feb. 1951, p. 154-166.

Results of experimental investigation using a model to represent conditions in the cryolite bath for production of Al. The model was a single-electrode bath consisting of $CuSO_4 \cdot 5H_2O$, H_2SO_4, and alcohol. (C23, Al)

74-C. Improved Plant Design Marks New Utah Refinery. Stanley Hughes. *Engineering and Mining Journal,* v. 152, June 1951, p. 72-79.

Procedures and equipment of the West's newest electrolytic copper plant operated by Kennecott Copper Corp., Garfield, Utah. (C23, Cu)

75-C. Vacuum Melting Titanium and Zirconium. *Steel,* v. 128, June 18, 1951, p. 77-79. (Based on paper by A. C. Haskell, Jr.)

Research on production of Ti and Zr ingots is concentrated on use of a graphite crucible under vacuum or inert atmosphere, heated in a high-frequency induction furnace. (C25, Ti, Zr)

D

FERROUS REDUCTION AND REFINING

192-D. AISE Specification for Design of Hot Metal Ladles. L. E. Madsen. *Iron and Steel Engineer,* v. 28, May 1951, p. 119-122.

Includes tabular and graphical data. (D9)

193-D. Alan Wood Steel Company. T. J. Ess. *Iron and Steel Engineer,* v. 28, May 1951, p. 1A-18A.

Comprehensive illustrated description of plant at Conshohocken, Pa. Includes coke plant, blast furnaces, openhearths, blooming mills, plate mills, strip mills, plant services, specialty division, and special products. (D general, F general, ST)

194-D. Full-Scale Blast-Furnace Trials. J. A. Bond and T. Sanderson. *Journal of the Iron and Steel Institute,* v. 168, May 1951, p. 24-39.

Selected trials, showing benefits to be derived from better selection and preparation of raw materials, ore, and coke, and from use of increased amounts of sinter in the burden. Attempts to improve distribution of the burden by alteration of design and to accelerate reduction by means of steam injection. Demonstrates that full-scale trials are practicable in a large organization without undue disruption of normal routine and output. (D1, Fe)

195-D. The Present Position of the Converter Process; Economic Comparison With Other Steelmaking Processes. Bernhard Matuschka. *Journal of the Iron and Steel Institute,* v. 168, May 1951, p. 40-45.

Compares economic aspects of openhearth and basic Bessemer steel production. (D3, D2, ST)

196-D. Fuel Flow; Works Trial of a Metering Pump. A. L. Cude and J. Stringer. *Journal of the Iron and Steel Institute,* v. 168, May 1951, p. 46-51.

Plant trial of a metering pump installed on a 75-ton openhearth furnace and operation for a total of approximately 400 hr. The pump gave much greater consistency of flow than normal hand-valve regulation, but this did not reduce variability of roof temperature. Shows that the metering pump would offer a number of advantages over the conventional motorized valve, as a component of an automatic temperature controller. (D2, S16, ST)

197-D. Explosive Charge Taps O. H. Furnace Safely. *Steel Equipment & Maintenance News,* v. 4, May 1951, p. 12-13.

New process. (D9, ST)

198-D. Metallurgy in the Graphite-Bar Furnace. (In German.) W. Gödecke. *Giesserei,* v. 38 (new ser., v. 4), Apr. 19, 1951, p. 169-174.

A furnace lined with stabilized dolomite can be used for the highly basic melting of steels and cast iron and is especially adapted to the decarburization, deoxidation, dephosphorization, and desulfurization of steels and to the production of spheroidal cast iron of high malleability. Analysis of a decarburized 18-8 Cr-Ni steel shows a relatively low loss of Cr, Ni, and Mo. (D2, E10, ST, CI, SS)

199-D. Stabilized Dolomite and Its Application in Steelmaking. (In French.) Marcel Guédras. *Métallurgie et la Construction Mécanique,* v. 82, Nov. 1950, p. 835, 837-839, 841.

Suggests a modified Chester process for stabilizing dolomite by adding serpentine in order to transform lime into the trisilicate. The product is a highly resistant furnace-lining material, said to be superior to magnesite. (D general, B19, ST)

200-D. Status of the Use of Machinery in the Iron and Steel Industry. (In German.) P. Voltz. *Zeitschrift des Vereines Deutscher Ingenieure,* v. 93, May 1, 1951, p. 341-348.

Innovations in blast-furnace plants, rolling mills, and forging mills. 12 ref. (D1, F22, F23, ST)

201-D. Non-Metallic Inclusions in Acid Openhearth Steel. (In Italian.) Alessandra Carlini. *Metallurgia Italiana,* v. 42, Dec. 1950, p. 435-456.

Identification of nonmetallic inclusions, their influence on mechanical properties of the finished product, and the influence of conditions of production on the amount and distribution of such inclusions. 31 ref. (D2, ST)

202-D. Open Hearth Charge Ores. John J. Golden and Henry E. Warren, Jr. *American Iron and Steel Institute,* Preprint, 1951, 15 pages.

Results of a questionnaire survey of 18 steel plants, covering 53 high-metal practices in 25 different furnace sizes with respect to quality requirements of basic openhearth charge oxides. (D2, B22, ST)

203-D. Steelmaking for Castings. John Howe Hall. *Foundry,* v. 79, June 1951, p. 109, 232, 234, 236, 238, 240.

Operation of the acid openhearth furnace, including typical heats. Fourth of a series on steel melting practice in production of castings. (To be concluded.) (D2, CI)

204-D. Statistical Analysis of Blast Furnace Production Data. D. S. Leckie. *Journal of Metals,* v. 3, June 1951, p. 443-444.

Procedures and equipment used; advantages. (D1, ST)

205-D. Sponge Iron a Remedy for Scrap Shortage? P. E. Cavanagh. *Steel,* v. 128, June 11, 1951, p. 92, 95, 98, 101.

If small tonnages of good, clean scrap are needed to make steel in electric furnaces, if a tunnel kiln is available, and if the steelmaker is willing to pay at least $40 a ton for scrap with no residual alloys, it can be made by the tunnel-kiln sponge-iron process. Procedures and equipment. (D8, ST)

206-D. All-Basic Open Hearth Furnaces. *Engineer,* v. 191, May 18, 1951, p. 644-648; May 25, 1951, p. 696-697.

Summarizes proceedings of BISRA conference held May 2-3, 1951. Seven papers were presented and discussed. (D2, ST)

207-D. Blast-Furnace Operation at High Top Pressure. R. P. Towndrow. *Engineering,* v. 171, May 11, 1951, p. 575-576; May 18, 1951, p. 607-609. (A condensation.)

Details of work at Clyde Iron Works in Scotland. (D1, Fe)

208-D. Some Experience With Decarburization by Means of Oxygen in a 2-Ton Electric-Arc Furnace. (In Italian.) Luciano Piana. *Metallurgia Italiana,* v. 43, Jan. 1951, p. 20-26.

The 3 following systems were tested: consumable lance; unconsumable lance with a refractory-protected end; and blowing of O_2 through the electrodes of the furnace. Results obtained in a continuous run, some economic considerations, and conclusions based on the routine production of carbon and low-alloy steels. (D5, CN, AY)

209-D. The Effect of Sinter on Blast Furnace Production as Determined by Analysis of Daily Operating Data. W. E. Marshall. *Blast Furnace and Steel Plant,* v. 39, June 1951, p. 661-664.

Previously abstracted from *American Iron and Steel Institute,* Preprint. See item 177-D, 1951. (D1, Fe)

210-D. Open Hearth and Electric Furnace Refractories. James R. Cady. *Blast Furnace and Steel Plant,* v. 39, June 1951, p. 684-687.

Suitability of various types of refractories for various parts of the openhearth. 22 ref. (D2, ST)

211-D. Recent Technical Progress in Basic Steel Furnace Refractories. Part I. F. I. Cordwell. *Refractories Journal,* Apr. 1951, p. 128-137.

First part of international survey outlines experience and working data with chrome-magnesite crowns in openhearth steel furnaces, and economies and metallurgical advantages as compared with silica furnaces. (To be continued.) (D2, ST)

212-D. Possibilities of Iron & Steel Making in India Without Coking Coal. H. Schrader and D. Jagat Ram. *Journal of Scientific & Industrial Research,* v. 10A, Apr. 1951, p. 157-165.

Estimates that Indian reserves of coking coal are sufficient to melt only about 25% of the total available quantity of iron ore in the country. Potentialities of various processes for production of iron and steel without use of coking coal. 32 ref. (To be continued.) (D general, Fe, ST)

E

FOUNDRY

317-E. Watch Your Cast Iron Chills! F. E. Sutherland. *American Foundryman,* v. 19, May 1951, p. 55-59.

Progressive formation of gas upon pouring a series of castings using the same set of chills was observed. The chills were subjected to critical physical and chemical examination in an attempt to determine the cause and nature of the gas. It was concluded that a set of chills should not be used more than three times, and that the gas is created by reduction of iron oxide by means of carbon. Possibilities of using graphite-free washes, low free-carbon irons, and steel chills. Includes macrographs and micrographs. (E23, CI)

318-E. Zircon Sand: Properties and Uses in Cores and Facings. Arthur Smith. *American Foundryman,* v. 19, May 1951, p. 64-67.

Technical and economic factors. Procedures and equipment. (E18)

319-E. Factors Affecting Oil-Sand Core Baking. Harry W. Dietert. *American Foundryman,* v. 19, May 1951, p. 67.

(E21)

320-E. Modern Foundry Methods. *American Foundryman,* v. 19, May 1951, p. 68-71.

Procedures and equipment of International Harvester Co.'s Memphis foundry. (E11, CI)

321-E. Discuss Preventing Casting Defects. *American Foundryman,* v. 19, May 1951, p. 81-87.

Informal discussion of a small group of Texas foundrymen who met in San Antonio as guests of *American Foundryman* to consider causes and remedies of several casting defects. (E general)

322-E. Finds Magnesium Will Dephosphorize Molten Iron When Added in Ladle. J. E. Rehder. *American Foundryman,* v. 19, May 1951, p. 95. (E25, CI, Mg)

323-E. The Plus and Minus of Steel Precision Investment Castings. A. C. Williams. *Materials & Methods,* v. 33, May 1951, p. 88-90.

Guideposts to help indicate when this process should be used with steel and high-temperature alloys. (E15)

324-E. Variations in the Density of Atmospheric Air With Special Reference to the Blowing of Cupola Furnaces. W. J. Driscoll. *British Cast Iron Research Association Journal of Research and Development,* v. 3, Apr. 1951, p. 877-882.

Density of atmospheric air may vary about ±8% from that of standard air. Where a constant reading of a volume gage (e.g., in a cupola air main) is maintained, either manually or automatically, the weight of dry air, and hence of oxygen, may vary by about ±4%. Therefore, use of "constant weight" air-control equipment for cupolas where close control over melting conditions and a high degree of day-to-day reproducibility are required seems desirable. (E10, CI)

325-E. Notes on Cast Iron—Past and Present. E. Longden. *Foundry Trade Journal,* v. 90, May 10, 1951, p. 487-496; May 17, 1951, p. 521-526.

Suggests that too much concentration of attention on the most recent developments is possible, at the expense of solution of the many troubles associated with the more common and special metals in everyday use. The problems referred to are those conducted with microporosity, cavities resulting from liquid shrinkage and gas and solid contraction. The question is posed, "Are discoveries in cast iron varieties outstripping the abilities and resources of the foundry industry?" Second part deals with cupola practice. (E25, CI)

326-E. Design of Castings. (In Dutch). F. B. H. Van Bergen. *Metalen,* v. 6, Apr. 30, 1951, p. 124-132.

Numerous diagrams illustrate general treatise on good molding and casting practice. (E19)

327-E. Pressure Casting of Aluminum Alloys. II. (In French.) R. Grunberg. *Métallurgie et la Construction Mécanique,* v. 82, Nov. 1950, 853, 855-857.

Al-Si-Cu ternary alloys were investigated particularly from the point of view of their applicability to pressure casting. Influence of different factors such as composition, crystal structure, etc., on quality of finished product. (E16, Al)

328-E. Pressure Casting of Zinc Alloys. (In German.) F. Richter. *Giesserei,* v. 38 (new ser., v. 4), Apr. 19, 1951, p. 174-179.

Recommended conditions for the process. Desirable and undesirable results obtained under different conditions. (E13, Zn)

329-E. Use of Sulfite Liquor in the Foundry. (In German.) K. Wittmoser. *Giesserei,* v. 38 (new ser., v. 4), Apr. 19, 1951, p. 181.

Sulfite liquor makes a satisfactory binder for green and dry-sand molds. Compressive strength of the mold greatly increases with density of the liquor. A few disadvantages are indicated. (E18)

330-E. How High Must the Tuyeres of Cupola Furnaces Be Above the Furnace Floor? (In German.) A. Knickenberg. *Giesserei,* v. 38 (new ser., v. 4), Apr. 19, 1951, p. 183.

A reduction in the distance between the tuyere level and the furnace floor increases the temperature of the Fe and reduces its C and S content. (E10, CI)

331-E. Advantages of Copper-Sprayed Cast Iron Core Boxes. (In German.) H. Reininger. *Giesserei,* v. 38, (new ser., v. 4), Apr. 19, 1951, p. 187.

The procedure and several important advantages. (E21, L23, CI, Cu)

332-E. Defects in Castings and Their Origin. (In Swedish.) Jörgen Drachmann. *Gjuteriet,* v. 41, Apr. 1951, p. 51-57.

The Foundry Division of the Swedish Federation of Mechanical Engineering Industries has a committee which has worked on the above problem since 1947. This first report deals with general problems related to such defects, their classification, and fundamental causes. (E25)

333-E. Metal Penetration and Adhesion in Sand Molds. (In Swedish.) Holger Pettersson. *Gjuteriet,* v. 41, Apr. 1951, p. 59-63.

See abstract under similar title from *Jernkontorets Annaler,* item 315-E, 1951. (E18, E25, ST)

334-E. What's Wrong With Castings? John B. Caine. *Foundry,* v. 79, June 1951, p. 106-108, 267-271.

A rebuttal to various claims for superiority of competitive processes over casting for manufacture of metal parts. The principles of design for avoidance or minimization of stress concentration are emphasized. Argues that many of the "rounded" defects, such as pores, blowholes, etc., in castings are actually not as likely to cause failure as are minute cracks typical of wrought metals. Distinction between hot tears and cracks. (E general, S21)

335-E. Rapid Growth Marks Texas Malleable Foundry. William G. Gude. *Foundry,* v. 79, June 1951, p. 110-113, 257-259.

Equipment and procedures of Texas Foundries, Inc., Lufkin, Texas. (E11, CI)

336-E. Design of Coreboxes and Driers for Use on Core Blowers. Elmer Blake. *Foundry,* v. 79, June 1951, p. 114-117, 260-264.

Important factors to be considered. How these parts are made for a typical core. (E21)

337-E. Structural Aspects of Tellurium and Graphite Additions for Chill Control in Cast Iron. Edward A. Loria. *Foundry,* v. 79, June 1951, p. 126-129, 212, 214, 216, 218.

Metallographic and physical characteristics resulting from tellurium-graphite additions to a normal chilled iron. Micrographs show structural differences of various levels below the chilled face of commercially made car wheels and changes in chill depth of test blocks caused by variations in amounts of the combined additions. (E25, CI)

338-E. Research and the Pilot Foundry. Harold J. Roadt. *Metal Progress,* v. 59, May 1951, p. 668-669.

Recommends use of "pilot" foundries as adjuncts to production foundries, as a means of conducting research for practical foundry problems without interfering with the production line. Refers to bronze foundries, but the arguments seem equally applicable to other types. (E general)

339-E. Phenolic-Sand Molds Cut Costs. *Modern Plastics,* v. 28, June 1951, p. 23.

Builders Iron Foundry, Providence, R. I., furnishes a typical case history to show the reduction in machining time possible by use of phenolic-resin molds. (E18, CI)

340-E. Magnesium Alloys Aid Desulphurization. S. L. Gertsman and B. F. Richardson. *Canadian Metals,* v. 14, May 1951, p. 20-23.

Experiments with induction heating using two methods of introducing a 50-50 Al-Mg alloy, which indicates that S in steel can be consistently reduced by 0.010-0.015%. Initial S content is shown to be unimportant; ductility is improved. (E10, ST, Al, Mg)

341-E. Loam Moulding of Pump Casings and Impellers. E. Clipson. *Foundry Trade Journal,* v. 90, May 17, 1951, p. 515-520; May 24, 1951, p. 547-550; disc., p. 550-551.

The making of a turbine impeller of the double-entry, shrouded pattern type, and also, of a volute section of a 102-in. centrifugal pump both produced by loam molding. (E11, CI)

342-E. Melting of Light Alloys; Factors Controlling Selection of Furnace. W. Geuthner. *Metal Treatment and Drop Forging,* v. 18, May 1951, p. 226-229.

(E10, Al, Mg)

343-E. Chill-Mold Casting of Brass. IV C. Several Frequently Occurring Defects in the Casting and Means of Prevention. (In Dutch.) T. Van der Klis. *Metalen,* v. 6, May 1951, p. 143-151.

Defects due to faulty pouring, trapped gases, and improper solidification and cooling conditions, also difficulties of removing the castings from the mold. Causes of such defects and possible remedies. (E23, E25, Cu)

344-E. Definition and Classification of Foundry Defects of Metallurgical Origin. (In French.) Albert Portevin. *Fonderie,* Feb. 1951, p. 2345-2357; disc., p. 2357-2358.

Defects in finished foundry products classified according to their origin; i.e., resulting from incorrect metallurgical treatment or from faulty casting technique. Methods for eliminating such defects. 11 ref. (E25)

345-E. Devices for Charging Small

Capacity Cupolas. (In French.) *Fonderie,* Feb. 1951, p. 2363-2365.
A series of simple devices makes it possible to eliminate to a great extent the manual charging operation. (E10, CI)

346-E. Economical Molds for Pressure Casting. (In French.) Maurice Billing. *Fonderie,* Feb. 1951, p. 2368-2373.
Advantages of using bronze molds instead of the much more expensive steel molds for small series of castings. Bronze suggested contains, besides Cu, about 10% Al, 4-6% Ni, 2-4% Fe, and small additions of other elements, such as Mn.
(E13, T5, Cu)

347-E. Production of Chill Molds. Part I. Literature Review. (In German.) E. Feil. *Giesserei,* v. 38 (new ser., v. 4), May 3, 1951, p. 205-210.
Numerous factors that affect the life-span of chill molds. 57 ref.
(E19, CI)

348-E. Slag Control in the Cupola. (In German.) E. Witten. *Giesserei,* v. 38 (new ser., v. 4), May 17, 1951, p. 221-227.
Theoretical principles; effect of basicity and Al_2O_3 content on Fe and Mn content; the desulfurization process; C and Si contents of the metal bath with slags of different basicity; and effects of fluorspar, furnace lining, and additions to the melt. 17 ref. (E10, B21, CI)

349-E. High-Vacuum Metallurgy. (In German.) H. W. Flemming. *Metall,* v. 5, May 1951, p. 188-192.
Different types of vacuum furnaces for melting of metals. (E10)

350-E. Induction-Heated Spoutless Crucible Melting Furnace. (In German.) P. Müller. *Metall,* v. 5, May 1951, p. 192-195.
Furnace is shown to have important advantages over other furnaces in the melting of Mg and its alloys, and other low-melting metals. (E10)

351-E. Centrifugal Steel Castings. J. Taylor and D. H. Armitage. *Aircraft Production,* v. 13, June 1951, p. 167-169.
See abstract of "Centrifugal Steel Castings for Gas Turbines," *Foundry Trade Journal;* item 200-E, 1951.
(E14, S13, CI)

F

PRIMARY MECHANICAL WORKING

128-F. Large Cast Brass Cakes Heated in Continuous Cycle at American Brass Plant. *Industrial Heating,* v. 18, May 1951, p. 806, 808, 810.
Describes large furnace which heats cast brass cakes weighing up to 3200 lb. each to a temperature of 1300-1500° F. preparatory to reduction by hot rolling to slabs less than ½ in. thick and up to 85 ft. long. It produces up to 40,000 lb. of cakes per hr. in a continuous cycle.
(F21, Cu)

129-F. Rolling of Tool Steels. H. C. Bigge. *Iron and Steel Engineer,* v. 28, May 1951, p. 57-65; disc., p. 65-66.
Classifies toolsteels into 6 basic groups. Equipment and procedures used by Bethlehem Steel Co. Approximate compositions are tabulated. Roll passes are diagrammed. Includes forging and heating equipment and procedures. (F23, TS)

130-F. Alloy Steel Prop Blades Made by Hot Extruding. *Materials & Methods,* v. 33, May 1951, p. 66-68.
Picture story of new process developed by Curtiss-Wright and U. S. Air Force engineers. (F24, SS)

131-F. The Counter-Blow Forging Hammer; Its Design and Application. Bernard Anscher. *Steel Processing,* v. 37, May 1951, p. 226-230, 257.
Models of the counter-blow hammer which Hydropress, Inc., has designed; compares them with conventional American drop hammers. (F22)

132-F. Increasing Drop Forging Die Life. Part V. Effect of Hammer Size. John Mueller. *Steel Processing,* v. 37, May 1951, p. 235-236, 250.
Includes tabular and graphical recommendations for choice of hammer size. (F22)

133-F. Forging Operations in Steam and Diesel Locomotive Practice. Part II. Steam Engine Forgings and Heat Treatment. R. E. W. Harrison. *Steel Processing,* v. 37, May 1951, p. 239-244. 25 ref. (F22, J general, ST)

134-F. American Steel and Wire Stainless Steel Plant at Waukegan. *Wire and Wire Products,* v. 26, May 1951, p. 394-397, 439.
Equipment and procedures. Annealing, cleaning and finishing, and cold rolling are applied to some of the material, in addition to wire drawing. (F28, J23, L general, SS)

135-F. Forging Methods. J. C. Stevens. *Engineering,* v. 171, May 4, 1951, p. 541-543. (A condensation.)
Practice of producing heavy steel forgings from early years to present. Modern production of hollow forgings by three methods. (F22)

136-F. Production of 20-Pounder Shells. *Engineering,* v. 171, May 11, 1951, p. 573-574.
Equipment and procedures of British plant. Includes forging, shearing, flame cutting, piercing, machining, etc. Material is steel.
(F22, G general, T2, ST)

137-F. Cold Rolling With Strip Tension. Part I. A New Approximate Method of Calculation and a Comparison With Other Methods. H. Ford, F. Ellis, and D. R. Bland. *Journal of the Iron and Steel Institute,* v. 168, May 1951, p. 57-72.
By making certain approximations to Orowan's general theory of rolling, it is possible to calculate roll forces and torque by a method which is both rapid and easy to apply, using basic information on yield-stress characteristics of the material to be rolled, coefficient of friction, and dimensions of the pass. Roll-force and roll-torque functions used in the calculations are shown by graphical form. The methods of Orowan, Hill, Siebel, Tselikov, and Nadai, are compared with the new method for a wide range of tensions. (F23)

138-F. Ringing in Wire-Drawing Dies. J. G. Wistreich. *Wire Industry,* v. 18, May 1951, p. 461, 463, 465.
Previously abstracted from *Journal of the Iron and Steel Institute.* See item 70-F, 1951. (F28)

139-F. Save $2000 by Flame Straightening. *Industry & Welding,* v. 24, June 1951, p. 38.
Use by a West Coast fabricator to strighten about a hundred heat-warped steel boxes each year.
(F29, CN)

140-F. Dies Hardfaced With Alloy Last Longer. Arthur Gray. *Iron Age,* v. 167, May 31, 1951, p. 68-70.
Applications of hard facing with a Ni-base alloy to multiply life of forging dies used to forge high-alloy steels. The alloy has been used mainly for high temperature aeronautical and heat treating applications. It is now being used in steel mills for rebuilding hot shear blades, shafts, dies, entry guides, and bearing surfaces. (F22, L24, AY, Ni)

141-F. New Roll Reduces High-Speed Steel Ingots. *Iron Age,* v. 167, June 7, 1951, p. 116.
Reduction of high-speed toolsteel ingots to billet form by rolling instead of hammering and forging has been made possible for the first time by use of a new cast steel roll. The roll is cast from a soft, tough Cu-Mo alloy steel. (F23, T5, TS, AY)

142-F. Extruding Copper and Brass. W. W. Cotter. *Journal of Metals,* v. 3, June 1951, p. 440-442.
One type of tube-extrusion press for these metals. Development and present status of the process.
(F24, F26, Cu)

143-F. Some Industrial Experiences With Synthetic Lubricants. C. H. Sweatt and T. W. Langer. *Mechanical Engineering,* v. 73, June 1951, p. 469-476.
The fluids discussed are polyalkylene glycols and their derivatives. A number of specific experiences under widely different operating conditions include metalworking operations as well as lubrication of machine parts. (F1, G21)

144-F. The Topock-Milpitas Gas Pipeline, California. *Engineering,* v. 171, May 25, 1951, p. 613-616.
Rolling, forming, and welding operations in production of 34-in. high-Mn steel pipe. (F26, K general, CN)

145-F. Wire-Drawing Die Bores. R. M. J. Withers. *Metal Treatment and Drop Forging,* v. 18, May 1951, p. 191-194.
Surveys methods for examining profiles of the bores. Some of the optical and mechanical methods and instruments used for this purpose.
(F28, S14)

146-F. Investigations Into the Causes of Drop Forging Faults. Hermann Rauhaus. *Metal Treatment and Drop Forging,* v. 18, May 1951, p. 205-213. (Translated and condensed.)
Previously abstracted from *Stahl und Eisen.* See item 112-F, 1950.
(F22, ST)

147-F. Redrawing as a Means of Reducing Internal Stresses Resulting From Cold Drawing of Metal Bars. (In German.) H. Böller. *Metall,* v. 5, May 1951, p. 195-198.
New process based on the discovery that relatively slight redrawing of steel and brass reduces internal stresses by more than 50%. The process is more economical than annealing and does not impair the mechanical properties and surface condition of the metal. 12 ref.
(F27, Q25, CN, Cu)

148-F. Production of Toolsteel Drawing Tools for the Production of Bright Steel. (In German.) Fritz Boehm. *Stahl und Eisen,* v. 71, May 10, 1951, p. 522-523.
Proposes a new hole design for dies for the drawing of round, hexagonal, and square bars. Old and new shapes are diagrammed and proposed dimensions are tabulated.
(F-27)

149-F. The Effect of Impurities on the Processing of Copper. (In German.) Otto Nielsen. *Zeitschrift für Erzbergbau und Metallhüttenwesen,* v. 4, May 1951, p. 169-176.
Effects of different inclusions in commercial Cu with emphasis on effects of oxides on hot and cold working, drawing, and welding. 22 ref.
(F general, G general, K general, Cu)

150-F. Concerning Elimination of a Rolling Defect. (In Italian.) Adolfo Antonioli and Renato Rolla. *Metallurgia Italiana,* v. 42, Nov. 1950, p. 418-420.
Small longitudinal defects on rolled round bars of Si-Mn spring steel were found to result from two successive passes without rotating the bar. Modification of the roll-pass designs results in elimination of the defect. (F23, AY)

151-F. Integrally-Stiffened Sections

Are Extruded. O. L. Mitchell. *Iron Age,* v. 167, June 14, 1951, p. 92-95.

Use of extrusion for production of sections in 24S and 75S Al. At present, production is for military experimental use, but plans are made to make this material commercially available as soon as possible. Relatively wide sections open a new field of design in all branches of engineering. (F24, Al)

152-F. New Device Increases Hammer's Operational Flexibility. *Steel,* v. 128, June 18, 1951, p. 80.

Control which enables the operator of this gravity-drop hammer to select either a long or short stroke of the ram at will. It increases the hammer's operational flexibility by making it possible to strike a series of short blows for rolling, drawing, fullering or edging; and then without interruption to strike a series of long blows for forging in the breakdown, rough, or finished impression of the forging die. (F22)

153-F. Steel Quality as Affected by Track Time and Soaking Pit Practice. A. F. Mohri. *Blast Furnace and Steel Plant,* v. 39, June 1951, p. 665-670.

Previously abstracted from *American Iron and & Steel Institute,* Preprint. See item 113-F, 1951. (F21, ST)

154-F. Recent Experiences in Copper Wire Drawing. W. Hodgkins. *Industrial Diamond Review,* new ser., v. 11, May 1951, p. 111-113.

Operations at a cable-manufacturing company, using sintered-carbide and diamond dies. (To be continued.) (F28, Cu)

155-F. Theory of Hollow Sinking of Thin-Walled Tubes. S. Y. Chung. *Metallurgia,* v. 43, May 1951, p. 215-218.

Using a modified criterion of plastic yielding, the author discusses the theoretical aspects of hollow sinking and compares his theoretical stresses with previously published experimental results on highly pre-strained phosphorus-deoxidized Cu and soft brass, and his predicted strains with recent research data on Al and brass. (F26, Cu, Al)

G

SECONDARY MECHANICAL WORKING

189-G. Solid Carbide Saws Cut Clean and Fast. Chester S. Ricker. *American Machinist,* v. 95, May 28, 1951, p. 120-121.

Various types and their applications to miscellaneous jobs. (G17, T5, C-n)

190-G. Prelocation Simplifies Turbine Blade Location. George Elwers. *Iron Age,* v. 167, May 24, 1951, p. 90-92. 90-92.

Fixtures to hold gas-turbine blades for machining would be complex and expensive. Fixtures to hold square boxes are simple, so blades are prelocated in boxes with an optical inspection device, then cast in place. Tips and roots, on which machining is to be done, protrude. (G17)

191-G. New Drawing Process Announced. *Iron Age,* v. 167, May 24, 1951, p. 97.

New mehtod of rubber-pad forming and drawing of sheet metal announced by Consolidated Vultee Aircraft Corp. Known as the Hidraw process, it utilizes a tough rubber pad in a restrictor box on the upper platen of the press, with a pressure pad and a moving punch on the lower platen. (G8)

192-G. Automatic Spinning of Stainless Steel in Production. L. W. Court. *Materials & Methods,* v. 33, May 1951, p. 86-87.

While stainless is rather difficult to spin, the process shows definite advantages over press forming on parts made of light-gage stock. (G13, SS)

193-G. Fundamentals of the Working of Metals. Part XXII. Difficulties Encountered in Simultaneous Forming. George Sachs. *Modern Industrial Press,* v. 13, May 1951, p. 6, 8, 26.

Definition and basic types of progressive work; simultaneous and progressive forming; forging difficulties due to simultaneous forming; interference in multiple blanking; and forming of corrugations. (G1)

194-G. Deep Drawing With 'Rubber Dies.' Fred Young. *Modern Metals,* v. 7, May 1951, p. 28-30.

Marform rubber-pad forming process. (G1)

195-G. Redesign Boosts Production With High Speed Steel Cutters. Guy Hubbard. *Steel,* v. 128, May 28, 1951, p. 76-77.

Results attained by a number of companies—show that under certain conditions high speed steel milling cutters can be made to turn out production approaching even that of tungsten carbide cutters. Radical changes in shape of milling-cutter teeth are responsible. (G17, TS)

196-G. 20 Miles of Pipe Per Day. *Steel,* v. 128, May 28, 1951, p. 78-80.

Equipment and procedures of new Napa, Calif., plant of Basalt Rock Co. Includes forming and submerged-arc welding. (G6, K1, CN)

197-G. Shaping Components With the Rotary Contour Former. *Western Machinery and Steel World,* v. 42, May 1951, p. 92-94.

Use of the Bath Roto-Former at Boeing Airplane Co.'s Wichita Div. The metals formed are 24S and 75S Al, SAE 4130 and stainless steels, Mg, and Ti. (G6, T24, Al, AY, SS, Mg, Ti)

198-G. Testing the Deep Drawability of Sheet Metal. Cup-Drawing Test and Bulge-Testing Process. (In German.) G. Oehler. *Zeitschrift des Vereines Deutscher Ingenieure,* v. 93, May 1, 1951, p. 371-374.

Critically evaluates test methods. Experience showed the second method to have serious disadvantages as compared to the first. Procedure of the cup-drawing test. 23 ref. (G4, Q23)

199-G. Plastic Deformation Measurements During Lathe Turning. (In German.) W. Leyensetter. *Zeitschrift des Vereines Deutscher Ingenieure,* v. 93, May 1, 1951, p. 375-378.

Tests made to determine the reciprocal effect between the cutting tool and the steel being machined. Results show that compression of the steel depends on cutting rate, cutting angle, work material, tool-steel, and cutting conditions. The deformation factor was also found to be very sensitive to changes of the cutting edge. (G17, Q28)

200-G. How to Produce More Holes With Your Drills. R. J. Sack. *Machinery* (American), v. 57, May 1951, p. 143-150; June 1951, p. 183-186.

Includes table of suggested speeds, drill angles, and coolants for use in drilling various materials. Suggested speeds and feeds for drilling; recommended coolants and cutting compounds; importance of proper drill sharpening; and essential requirements in correct drill sharpening. Second part: advantages of machine grinding; web-thinning procedure; recommended abrasive wheels; and inspection methods. (G17)

201-G. Possibilities and Limitations of the Marform Process. Henry P. Hessler, J. E. Broderick, and Fred C. Young. *Machinery* (American), v. 57, June 1951, p. 166-171.

Use of a rubber cushion or pad, in conjunction with precisely controlled hydraulic pressure, for forming and drawing parts of various materials and shapes. Formability of various materials and shapes, shearing and trimming, tooling, etc. (G1)

202-G. New Process for Producing Holes in Hard Metal. A. Kuris. *Machinery* (American), v. 57, June 1951, p. 175-176.

How holes, recesses, or external contours of various shapes can be quickly formed in carbide or other hard materials by means of a new method; involves use of rapidly vibrating tool operating in a mixture of water and abrasive. (G17)

203-G. How to Drill Cast Iron With Carbide Twist Drills. *Machinery* (American), v. 57, June 1951, p. 195-197.

Recommendations of Carboloy Co. (G17, T5, CI, C-n)

204-G. Carbide Drills Increase Tool Life on Cast Iron. E. J. Weller, E. J. Bonesteel, and F. W. Lucht. *Iron Age,* v. 167, May 31, 1951, p. 75-79.

Test procedure was to determine, first, the characteristics of different types on a laboratory basis, and then to follow this with production testing of a single drill style tipped with different grades of carbide. Data on thrust, vibration, torque, horsepower, and drill reconditioning. Drills and apparatus. (G17, T6, CI, C-n)

205-G. Effects of Precompression on the Behavior of the Aluminum Alloy 24ST4 During Cyclic Direct Stressing. S. I. Liu. *Journal of Metals,* v. 3, June 1951; *Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 191, 1951, p. 452-456.

Strain history of the alloy was extended to the combination of a single prestrain in tension or compression followed by balanced strain cycles of a selected magnitude. It was found that only compressive initial prestrains could be investigated with sufficient accuracy. A study was also made of the effect of intermediate re-solution heat treatment on low-cycle fatigue behavior. 11 ref. (G23, Q7, Al)

206-G. How to Design and Build Plastic Tooling for Press Production. A. E. Noble. *Magazine of Tooling and Production,* v. 17, June 1951, p. 48-49, 104, 108, 113, 117, 132.

Varied examples in the aircraft industry. Emphasizes advantages and suggests adoption by other industries. (G1)

207-G. Specification and Application of Automotive Drawing Compounds. James T. O'Reilly. *Magazine of Tooling and Production,* v. 17, June 1951, p. 50-51, 88, 96-97, 100-101.

Emphasis is on press-forming operations on low-carbon steel, and on practice, rather than theory. (G21, CN)

208-G. Deep Draw and Waffle Forming. Gilbert C. Close. *Modern Machine Shop,* v. 24, June 1951, p. 90-96, 98, 100, 102-103.

Application of the metal-forming process in which a metal sheet is compressed in one direction while being elongated in another to provide for greater deformation of the sheet. Design standards meet the critical tolerances and safety factors involved in aircraft production. (G4)

209-G. Ball Extruding Buick Torque Tube Flanges. Fred W. Vogel. *Modern Machine Shop,* v. 24, June 1951, p. 136-138.

An interesting forming operation which has enabled Buick to considerably increase flange production. Pos-

sibility of other applications. Material is SAE 1008 steel. (G5, CN)

210-G. Designing Drawing and Redrawing Dies. C. W. Hinman. *Modern Machine Shop,* v. 24, June 1951, p. 140-143, 146, 148.

Operating principle of drawing dies and several designs of such dies. (G4)

211-G. How to Drill Cast Iron With Carbide Twist Drills. Fred W. Lucht. *Modern Machine Shop,* v. 24, June 1951, p. 220-222, 224, 226, 228, 230.

(G17, T6, CI, C-n)

212-G. Metal Spinning Now a Mass-Production Tool. Dan Reebel. *Steel,* v. 128, June 4, 1951, p. 88-91, 114.

Newly designed lathe equipment which easily handles Types 430 and 446 stainless alloys — materials which heretofore were considered to be nonformable. Diagrams show basic shapes that can be successfully spun, also principles of redesign for spinning. Table gives relative adaptability of a wide variety of metals and alloys to spinning. (G13)

213-G. How to Drill Cast Iron With Carbide Tipped Twist Drills. Fred W. Lucht. *Steel,* v. 128, June 4, 1951, p. 92-93.

How increased production and longer tool life are being obtained, using conventional machines to drill cast iron at high speeds.

(G17, CI, C-n)

214-G. Production Techniques as Defence Reserves. D. F. Galloway. *Engineer,* v. 191, May 18, 1951, p. 639-644.

Work of the Mechanical Engineering Research Organization, a British group initiated by the Institution of Mechanical Engineers for research on fundamental aspects of metal machining and forming, and methods for improvement of industrial productivity. Several examples, including graphs and tables showing results of machining and drilling tests. Factors affecting typical machining and presswork operations; some experimental equipment. (G general)

215-G. Deep Drawing of Hollow Articles of Heavy Sheet Steel. (In German.) Ulrich Bauder. *Stahl und Eisen,* v. 71, May 10, 1951, p. 500-512.

Optimum methods were determined mathematically. Diagrams, photographs, tables, and graphs. 19 ref. (G4, ST)

216-G. Industrial Measurement of the Guide Length of Drawing Dies. (In German.) Werner Lueg. *Stahl und Eisen,* v. 71, May 10, 1951, p. 517-521.

A new method for measuring length of the tapered guide hole of dies with and without rounded edges. Graduations on the instrument directly indicate the guide length. It can be used to determine rapidly the position of the guide in the hard-metal core and in the mounting. (G4)

217-G. Reducing Internal Stresses in Cold-Drawn Materials by Burnishing. (In German.) Hans Bühler. *Stahl und Eisen,* v. 71, May 10, 1951, p. 521-522.

Investigations on plain-carbon steel showed that burnishing not only increases surface quality and strength, but also converts undesirable tensile stresses of cold drawn material into desirable compressive stresses. (G23)

218-G. Progressive Die Makes Tiny Cups. Pierre Wilmus. *American Machinist,* v. 95, June 11, 1951, p. 138-139.

Punching operation is shown in a series of diagrams and photographs. 50,000 finished J-section Ni cups can be turned out per month. (G2, Ni)

219-G. Acid Pickle Doubles Tool Life on CI. J. Datsko. *American Machinist,* v. 95, June 11, 1951, p. 140-141.

Research at University of Michigan shows the interior of a sand casting can be machined with high speed steel tools 88% faster than the surface. Pickling in hydrofluoric acid increases surface machinability 80% however, and lengthens tool life 45 times. (G17, L12, CI, TS)

220-G. Machine Lapping With Continuously Fed Free Abrasives. Fred L. White. *American Machinist,* v. 95, June 11, 1951, p. 161-163.

A method which produces light-band flatness and fine finish in fast, preset time cycles. Tables show characteristics of various types of abrasives, and stock-removal rates for different types of material. (G19)

221-G. The Mechanism of Grinding and the Function of the Lubricant. J. O. Outwater. *Lubrication Engineering,* v. 7, June 1951, p. 123-124, 144.

Behavior of single grains of abrasive in contact with metal. The chemical reaction between the metal being ground and the atmosphere in which it is ground is a dominating factor in grinding. The lubricant is effective only after the cutting has been completed. Its effect on cooling the surface of the metal is negligible, its purpose being to prevent the bulk of the metal from overheating and to reduce the friction between the severed chip of metal and the bulk of the uncut metal. (G18, G21)

222-G. Balanced Gear-Tooth Design. John C. Straub. *Machine Design,* v. 23, June 1951, p. 178-180, 218, 220. (A condensation.)

How shot peening increases bending strength and permits design for greater scoring resistance. (G23, T7)

223-G. Cold Forming of Low Carbon Steel. Part III. Lester F. Spencer. *Steel Processing,* v. 37, May 1951, p. 232-234.

Steps in deep drawing of typical simple pieces. (To be continued.) (G4, CN)

224-G. Production Developments; Some American Post-War Developments in Airframe Tooling. T. E. Piper. *Aircraft Production,* v. 13, June 1951, p. 187-193.

Most of the developments described are of the limited-production type of tool and include forming, fabricating, and welding equipment. (G general K general, T24)

225-G. Economic and Engineering Aspects of Machinability and Formability in Production Practice; Implications of Some Recent Experiments and Experiences. D. F. Galloway. *Research,* v. 4, June 1951, p. 263-273.

See abstract of "Production Techniques as Defense Reserves," *Engineer,* item 214-G, 1951. (General)

226-G. Oxygen-Flux Cutting of Cast Iron. (In Russian.) S. G. Guzov and O. Sh. Spector. *Avtogennoe Delo* (Welding), v. 22, Jan. 1951, p. 16-18.

Proposes a new method applicable to cast-iron billets up to 360 mm. in diam. (G22, CI)

227-G. (Book) **Metal Processing. Ed. 2.** Orlan William Boston. 763 pages. John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y. $7.50.

Machine processes, accessories, and tools. Correlation between design, metals, and manufacturing of a product. Steps involved in designing for production are covered in the first chapter. Subsequent chapters treat the various classes of machines and the processes and factors with which they are involved. Engineering specifications and standards are provided, together with pertinent references. (G general, S14)

H

POWDER METALLURGY

50-H. Sintering of Synthetic Latex Particles. R. E. Dillon, L. A. Matheson, and E. B. Bradford. *Journal of Colloid Science,* v. 6, Apr. 1951, p. 108-117.

Recent developments in the use of synthetic lattices in the paint, paper, and textile industries have focused attention upon the mechanism by which polymer particles, at comparatively low temperatures, are welded together into a coherent film. Results may be qualitatively applied in the field of powder metallurgy. (H15)

51-H. Use of Fusible Cores When Producing Components by Powder Metallurgy. *Machinery* (London), v. 78, May 10, 1951, p. 775-776.

New development described in a recent German patent applied for by Michigan Powdered Metal Products Co., Northville, Mich. (H14)

52-H. Identification of Reactions in the Sintering of Compacted Binary Metal-Powder Mixtures by Measuring Their Linear Thermal Expansions. (In German.) Ernst Raub and Werner Plate. *Zeitschrift für Metallkunde,* v. 42, Mar. 1951, p. 76-82.

Sudden expansion, which may exceed 50% of the original length, indicates formation of intermediate phases, often at relatively low temperatures. Experiments with several different alloys show suitability of expansion measurement for study of reactions occurring during sintering of metal powders. (H15)

53-H. Report of Committee B-9 on Metal Powders and Metal Powder Products. W. A. Reich, chairman. *American Society for Testing Materials,* Preprint 14, 1951, 5 pages.

Includes proposed tentative specifications for sintered-metal-powder structural parts from bronze.

(H general, S22, Cu)

54-H. The Manufacture of Cemented Tungsten Carbide. B. E. Berry. *Murex Limited Review,* v. 1, No. 8, 1951, p. 165-183.

Begins with concentration of wolfram and scheelite for production of tungstic acid. Succeeding steps are: production of W powder by reduction of the acid; production of W carbide by hot ball milling with carbon powder; alloying with TiC (in some cases); alloying with Co powder; pressing and shaping; sintering; hot pressing; and fitting the carbide cutting inserts into tools of various kinds.

(H general, W, C-n)

55-H. A Process for Production of Phosphorus-Copper Alloys. (In German.) E. R. Thews. *Metall,* v. 5, May 1951, p. 198-201.

Critically evaluates older and more modern methods for production of Cu-P alloys containing 14-15% Cu. Experimentally substantiates the possibility of producing these alloys by powder-metallurgy methods.

(H general, E general, Cu)

56-H. High-Temperature and Scale-Resistant Sintered Materials. (In German.) Richard Kieffer and Friedrich Benesovsky. *Zeitschrift für Metallkunde,* v. 42, Apr. 1951, p. 97-106.

Review of literature shows that powder metallurgy is an increasingly used method of producing high-temperature-resistant metallic, semimetallic, and nonmetallic materials and castings. Advances in the field of high-temperature materials. 85 ref. (H general, SG-h)

57-H. Preparation of Metals in a

Finely Divided State for Use as Catalyst. W. J. C. de Kok and H. I. Waterman. *Journal of Applied Chemistry,* v. 1, May 1951, p. 196-198.

Metals and alloys, commonly used as catalysts, are prepared in a finely divided state by atomizing under pressure. The sprayed particles are activated by oxidation, e.g., with sodium hypochlorite solution, washed, dried, and reduced with H_2. The metals and alloys examined were Ni, Ni-Cr (80% Ni, 20% Cr), monel, and V_4 steel, the starting material being wire in all cases. (H10, T29, Ni, AY)

58-H. Production of Powdered Alloys of Chromium and of Manganese. (In French.) Pierre Jolibois and Bernard Fleureau. *Comptes Rendus hebdomadaires dés Séances de l'Academie des Sciences,* v. 232, Mar. 28, 1951, p. 1272-1274.

Experimental work on production of Cr and Mn by hydrogen reduction of metallic oxides. Reduction of Fe_2O_3 was also studied alone and in mixtures with Cr_2O_3 and Mn_3O_4, respectively. (H10, Cr, Mn)

J

HEAT TREATMENT

151-J. Why a Commercial Heat Treater Prefers Gas. Richard W. Thorne. *Industrial Gas,* v. 29, May 1951, p. 12-13, 28-30.

Opinions of president of Bennett Steel Treating Co., Newark, N. J. (J general)

152-J. Cyclic Annealing Direct From Forge Operations Produces Outstanding Results at Ford Plant. *Industrial Heating,* v. 18, May 1951, p. 790-792, 794, 796, 798, 800, 802, 804, 950.

New technique of annealing forgings rapidly and uniformly by process which utilizes the residual heat in forgings directly from the press. Driving ring gears and stem-type driving pinions are iso-thermal-annealed in the salt-bath furnace. (J23, AY)

153-J. High Speed Reheating of Seamless Steel Tubes. H. W. Cox. *Industrial Heating,* v. 18, May 1951, p. 837-840, 842, 844.

Use of radiation pyrometry for successful control of a new high-gradient heating process. The basic principle of this type of heating and the furnace installation itself. (J general, S16, ST)

154-J. Carbonitriding Produces Hard Case at Lower Temperatures. Samuel Damon. *Materials & Methods,* v. 33, May 1951, p. 64-65.

When large quantities of small parts can be treated simultaneously, dry cyaniding is said to have advantages of lower cost, less distortion, and cleaner, safer operation. Typical application to cold drawn low-carbon steel tubing. (J28, ST)

155-J. Metallurgical Considerations on the Gaseous Annealing of Whiteheart Malleable. Fritz Schulte. *British Cast Iron Research Association Journal of Research and Development,* v. 3, Apr. 1951, p. 883-901; disc., p. 902-904.

Critical analysis of the two processes of importance in the above: decarburization and graphitization. (J23, N8, CI)

156-J. Gaseous Annealing of Malleable Castings; The Present Position. P. F. Hancock. *British Cast Iron Research Association Journal of Research and Development,* v. 3, Apr. 1951, p. 905-922; disc., p. 923-924.

Details of equipment and procedures. Divided into sections on whiteheart and blackheart types. (J23 C1)

157-J. An Application of the Absolute Reaction Rate Theory to Some Problems in Annealing. F. Wm. Cagle, Jr., and Henry Eyring. *Journal of Applied Physics,* v. 22, June 1951, p. 771-775.

Absolute rate theory is combined with molecular models in the study of annealing of metals and of glass. It is thus possible to obtain expressions which are in close agreement with experimental data. Both the observed first-order data for metals and the second-order data for glass are predicted in this way. 16 ref. (J23)

158-J. Flame Hardening. E. F. Green. *Industry & Welding,* v. 24, June 1951, p. 48-49, 51-53.

The process and its applications. Materials (steels, cast irons, malleable irons), mechanical equipment, and heating equipment. (To be continued.) (J2, ST, CI)

159-J. Control Salt Bath When Heat-Treating High-Speed Steel. J. G. Morrison. *Iron Age,* v. 167, May 31, 1951, p. 63-66; June 7, 1951, p. 110-113.

Depending on analysis, condition, and method of rectification, salt baths may have varying effects on high speed steel during heat treatment. A simple test helps predict whether decarburization or carbon pickup will occur, and whether the steel is unduly soluble in the bath. (J2, TS)

160-J. Developments in Production Practice: Production Applications of Induction Heating. *PERA Bulletin,* v. 4, May 1951, p. 317-323.

Advantages of induction heating, elementary principles, costs, and applications to hardening operations, brazing and soldering, forging, stoving, and dielectric heating. 80 ref. (J2)

161-J. The Homogenisation of Steel Castings and Its Influence on the Mechanical Properties. *Metal Treatment and Drop Forging,* v. 18, Apr. 1951, p. 145-154; May 1951, p. 195-200.

Part of the research program of the Steel Castings Div. of the BISRA. First section: results obtained on normal-quality castings in the form of keel blocks or cloverleaf test blocks of plain carbon and low-alloy steels produced by the basic electric arc or acid high-frequency processes. Second part: effects of homogenizing plain carbon steels, made in acid electric arc furnaces and cast in the form of cloverleaf test blocks. They had unsatisfactory tensile properties after the usual heat treatment. (J21, Q general, CI)

162-J. Induction Hardening and Brazing. R. J. Brown. *Metal Treatment and Drop Forging,* v. 70, May 1951, p. 214-221.

Practical applications of the high-frequency method of heating with reference to actual production applications as distinct from laboratory experiments. Equipment, procedures, and brazing materials. Economics for various applications. (J2, K8)

163-J. The Metallurgy of Heat-Treatment of Whiteheart Malleable Iron With Emphasis on Gas Malleabilizing. (In German.) Fritz Schulte. *Giesserei,* v. 38 (new ser., v. 4), May 3, 1951, p. 197-205.

See abstract of "Metallurgical Considerations on the Gaseous Annealing of Whiteheart Malleable," *British Cast Iron Research Association Journal of Research and Development;* item 155-J, 1951. (J23, N8, CI)

164-J. Copper and Copper Alloys. 3. Stress Aging of Brass. W. G. R. de Jager (In German.) *Metalen,* v. 6, May 1951. p. 154-156.

Effect of temperature and time of stress-relief treatment on properties of brasses, bronzes, and other Cu alloys. Includes extensive tabular data on resulting mechanical properties. (J1, Q general, Cu)

165-J. Heat Treating Lead-Bronze Bearings Above the Melting Point of Lead. (In German.) A. Röhenbeck. *Metall,* v. 5, May 1951, p. 201-203.

Experiments were made with sleeve bearings, 1 mm. and 6.5 mm. thick, heated at 250, 680, and 830° C. in order to find means of adapting the sleeve to a higher-carbon or alloyed, and therefore stronger, backing steel. Photomicrographs show effects of different temperatures on structure of the bearing. (J general, Pb, Cu, SG-c)

166-J. Graphitization of the Surface Layer of Steel. (In German.) R. Oettel. *Metalloberfläche,* ser. A, v. 5, May 1951, p. 74-75.

Purpose of experiments was to combine the high-strength properties of steels with the good frictional and wear properties of cast iron. Conditions required to obtain, or to avoid, the formation of elementary carbon and the method of confining graphitization to the surface. (J26, ST)

167-J. Experiences in the Construction of Pipe Lines With Emphasis on Heat Treating. (In German.) H. Kirshfield. *Schweissen und Schneiden,* v. 3, Apr. 1951, p. 126-128.

Factors that affect the quality of steel pipe welds and the proper procedure for stress-relief annealing and for normalizing. (J1, J24, CN)

168-J. Plant Results From a Wire-Patenting Furnace Heated With City Gas. (In German.) Franz Domes. *Stahl und Eisen,* v. 71, May 10, 1951, p. 512-516; disc., p. 516.

Comparison of a coal-fired with a gas-fired furnace shows that the heat consumption of the latter is 78% less and the output 45% greater than the former. Results from the gas-fired furnace were also compared with published data. (J25)

169-J. Calculation of Intensity of Diffusion Dispersion of X-Ray During Aging of Alloys. (In Russian.) Yu. A. Bagaryatskii. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 77, Mar. 1, 1951, p. 45-48.

Proposes a new method. Theoretical bases and equations used, and technique of calculation. Application of this calculation to Al-Cu and Al-Mg alloys in different stages of aging showed the validity of the proposed method. 13 ref. (J27, N7, Al, Cu, Mg)

170-J. Co-Deposited Stopoff Conserves Tin. E. S. Cee. *Iron Age,* v. 167, June 14, 1951, p. 86-88.

Pure Sn is used to form a protective barrier against the furnace atmosphere in selective hardening of parts requiring localized case hardening. A co-deposited alloy plating of 5-15% Sn and 85-95% Cu makes an effective substitute, greatly reducing Sn consumption and also being cheaper. (J28, L17, ST, Cu)

171-J. High Speed Quenching Oils Increase Surface Hardness. W. J. Reitze. *Steel,* v. 128, June 18, 1951, p. 72-74.

Shows that quenching efficiencies of these oils impart additional hardness to steels, especially to low-carbon steels, permitting their use in many places formerly requiring alloy grades. (J2, ST)

172-J. Recent Heat Treatment Installations. *Metallurgia,* v. 43, May 1951, p. 221-233. (J general)

173-J. The Heat Treatment of Aluminum Alloys. J. Crowther. *Metallurgia,* v. 43, May 1951, p. 243-247.

Based on Wilm's discovery that an Al alloy containing 4% Cu and ½% Mg hardened on standing at

room temperature after quenching from 500° C., a number of alloys were developed giving improved mechanical properties—some after precipitation at elevated temperatures. Treatment of certain types of these alloys. (J27, Al)

174-J. Cementation by Carbon and Nitrogen. (In French.) J. Pomey. *Métaux Corrosion—Industries,* v. 26, Feb. 1951, p. 49-80.

Previously abstracted from *Revue des Séances de l'Academie des Sciences,* v. 232, Mar. 12, 1951, p. 1116-1118.

175-J. Study of Electron Diffraction of the Carburization of Iron. II. Action of the Mixture $CO+H_2$. (In French.) Jean-Jacques Trillat and Shigueo Oketani. *Comptes Rendus hebdomadaires des Séances de l'Academie des Sciences,* v. 232, Mar. 12, 1951, p. 1116-1118.

Two cases were studied: carburization in pure CO and in $CO+H_2$ mixtures. Mechanisms of both processes. (J28, Fe)

176-J. Annealing of Whiteheart Malleable Cast Iron. (In French.) G. Joly. *Métaux Corrosion—Industries,* v. 26, Jan. 1951, p. 3-9.

Factors in the transformation of white cast iron into whiteheart malleable Fe, such as oxidation agents, temperature of annealing, chemical composition of metal, thickness of casting, etc. Particularly, the mechanics of decarburization, rate of dissolution of cementite, etc., are investigated. (J23, CI)

K

JOINING

328-K. Set Up Steel Casting Welding Standards and Procedures. John D. Wozny. *American Foundryman,* v. 19, May 1951, p. 72-79.

Establishment of welding standards at American Steel Foundries, East Chicago, Ind., on the basis of results of investigation of plain-carbon (Grade B), intermediate (1.60%) Mn, and SAE 1040 steels. (K general, CI)

329-K. How to Save 30% on Steel. *Architectural Forum; The Magazine of Building,* v. 94, May 1951, p. 113, 234.

Van Rensselaer P. Saxe, Baltimore structural engineer, comments on recommendations that welding plus higher stresses offers a far better way to meet the shortage of structural steel than threatened cuts in construction. Shows that not 10%, but 30% of all the steel now used in a typical riveted steel-frame commercial building could be saved by a judicious combination of higher allowable stresses, field welding, and rigid frame design. (K general, T26, CN)

330-K. Manipulator Carries Automatic Welding Head. H. E. Hodges. *Iron Age,* v. 167, May 24, 1951, p. 93-94.

Development and operation of automatic welding at Continental Foundry and Machine Co., Chicago. (K1)

331-K. Notch-Coil Brazing Rings Boost Production. *Iron Age,* v. 167, May 24, 1951, p. 102.

Brazing output of electrical transformer connectors was raised 62% over previously used machine-wound individual rings. Other advantages. (K8)

332-K. What You Can Do With Submerged Arc Welding. C. A. Heffernon. *Materials & Methods,* v. 33, May 1951, p. 82-85.

Unionmelt welding produced high-quality welds at high speeds in most of the commercially used ferrous and nonferrous metals, with the exception of Mg and Al. (K1)

333-K. Riveting Aluminum: Types of Rivets, Joints, Equipment; How to Use Them; Special Practices. F. F. Dietsch. *Modern Metals,* v. 7, May 1951, p. 40-45.

Details, clarified by diagrams. (K13, Al)

334-K. Unique Pressure Vessel Produced. *Steel Processing,* v. 37, May 1951, p. 237, 250.

Production of welded stainless-steel spherical storage chamber by multiple-pass arc welding. (K1, T26, SS)

335-K. The Design of Welds. A. G. Thompson and F. Brooksbank. *Welding & Metal Fabrication,* v. 19, Apr. 1951, p. 140-144; May 1951, p. 184-191.

Recommendations clarified by diagrams, photographs, and numerical examples. 14 ref. (K general)

336-K. Resistance Welding of Cross-Wire Joints. R. Bushell. *Welding & Metal Fabrication,* v. 19, May 1951, p. 175-178.

Process applied to manufacture of miscellaneous articles such as bird cages, milkbottle containers, refrigerator shelving, etc. It can be applied to low-carbon mild steel wire, brass, stainless steel, copper-coated mild steel, and galvanized steel wire. However, mild steel wire, either plain, bright, galvanized, or copper-coated, is in greatest demand. (K3, CN, Cu, SS)

337-K. Assembly Line for Welded Car Frames. *Western Metals,* v. 9, May 1951, p. 34-35.

Assembly of freight-car frames at two Los Angeles plants of Consolidated Western Steel Corp. (K1, T23, CN)

338-K. The Status of Light-Metal Resistance Seam Welding. F. Gerspacher. *Brown Boveri Review,* v. 37, Aug.-Sept. 1950, p. 281-288.

Electrical and mechanical designs; correct roller contour; correct overlap; appearance; tests and results on separation, micrography, tensile strength, pressure, and X-ray. Recommended weldable Al alloys and results of experimental welds. (K3, Al)

339-K. The Weldability of High-Strength Structural Steel. (In Italian.) Alberto Nacher. *Metallurgia Italiana,* v. 42, Dec. 1950, p. 456-472.

Influence of factors such as composition, heat treatment, rate of cooling, etc., on sensitivity and local brittleness of the welds. A new weldability test is proposed, based on hardness determination. (K9, CN)

340-K. Engineering "Know How" Combines With Resistance Welding to Provide Increased Production. *Industry & Welding,* v. 24, June 1951, p. 25-27.

Use in production of Maytag washers. (K3, CN)

341-K. Here's How to Rebuild Worn Equipment. *Industry & Welding,* v. 24, June 1951, p. 28, 90.

Use of automatic submerged-arc welding machines to restore heavy equipment, such as tractor rollers. (K1, CN)

342-K. Stud Welding Reduces Costs in the Construction Field. *Industry & Welding,* v. 24, June 1951, p. 33-34.

Use in rapid erection of two hangars for Northwest Airlines in Minneapolis. (K1, CN)

343-K. Welded Rail Costs 30% Less. Bernard J. Smolka and Herbert Gefvert. *Industry & Welding,* v. 24, June 1951, p. 36, 94.

Fabricated slide rail which replaces original cast-iron design at Reliance Electric & Engineering Co., with cost saving of almost 30% and 60% in weight. (K1, CN)

344-K. Inert-Arc Raises Aluminum Frame Production by 70%. *Industry & Welding,* v. 24, June 1951, p. 46.

Procedures and equipment of ABC Steel Equipment Co., Tampa, Fla. (K1, Al)

345-K. High-Strength Pressure Vessel of Welded Stainless Steel. *Machinery* (American), v. 57, June 1951, p. 187.

Arc weld construction of spherical vessel for liquid N_2 at −340° F. (K1, SS)

346-K. How to Use Low-Melting Filler Metals in Die Construction and Repair. R. H. Groman. *Magazine of Tooling and Production,* v. 17, June 1951, p. 52-53, 72, 76, 80, 143, 145, 147.

Weld-repair procedure. Both electric-arc and torch welding are used. (K1, K2, TS)

347-K. Cost of Welding Stabilized Stainless. David W. McDowell, Jr. *Metal Progress,* v. 59, May 1951, p. 650-652.

Welding tests were made and costs evaluated for both Type 321 and 347 stabilized stainless sheet. Inert-arc and metallic-arc welding processes were used. The results indicate that more satisfactory and more economical weldments can be made from Type 321 than from Type 347 sheet. (K1, SS)

348-K. Bonding of Titanium Carbide With Metal. Walter J. Engel. *Metal Progress,* v. 59, May 1951, p. 664-667.

Previously abstracted under similar title appearing in National Advisory Committee for Aeronautics, Technical Note 2187, Sept. 1950. See item 629-K, 1950. (K5, M27, Ti, C-n)

349-K. Welding Air Hardening Steels. *Metal Progress,* v. 59, May 1951, p. 698, 700, 702, 704, 706. (Condensed from "Welding Air-Hardening Alloy Steels," Walter H. Wooding.)

Previously abstracted from *Welding Journal.* See item 681-K, 1951. (K1, K9, N8, AY)

350-K. Stringer Beads Run By Four Welders. Shannon L. Pound. *Oil and Gas Journal,* v. 50, May 31, 1951, pt. 1, p. 110.

Technique used by Western Pipe Line Constructors, Inc. Satisfactory results were obtained by avoiding difficulties which have baffled previous attempts to use four instead of the customary two stringer-bead welders. (K1, CN)

351-K. Arc Welding of Stainless Steel. M. N. Vuchnick. *Canadian Metals,* v. 14, May 1951, p. 34-35, 38, 41-42.

Recommended procedures. (K1, SS)

352-K. Influence of Length of a Butt Weld on Its Transverse Contraction. (In French.) F. Campus. *Comptes Rendus hebdomadaires des Séances de l'Académie des Sciences,* v. 232, Feb. 26, 1951, p. 792-794.

Earlier research established that contraction is dependent on increase of length. Thorough experimental investigation showed that this dependence is logarithmic. Method of investigation, results and their practical applications. (K general)

353-K. An Improved Two-Flame Welding Method. (In German.) K. Krekeler and H. Kunz. *Schweissen und Schneiden,* v. 3, May 1951, p. 142-147.

Equipment and procedures. Comparative test data on quality, efficiency, and economy of single-torch and double-torch welding of steel. (K2, ST)

354-K. Welding the Tunnel Reinforcement for the High-Pressure Duct of a Hydroelectric Power Plant. (In German.) R. Malisius and W. Liebig. *Schweissen und Schneiden,* v. 3, Apr. 1951, p. 103-107.

Plans, designs, preparation, and procedure for welding a duct (6 meters in diam. and made of 14-mm. sheet steel) passing through a tunnel. The welds were X-rayed for possible defects. Includes a cost analysis of Unionmelt welding and of electric-arc welding. (K1, CN)

355-K. The Weight of Seam Welds

in Steel. (In German.) H. v. Neuenkirchen. *Schweissen und Schneiden*, v. 3, Apr. 1951, p. 108-110.

A method of computing the above. (K3, ST)

356-K. Welding With Argon as Protecting Gas. (In German.) H. Bühler and W. Günther. *Schweissen und Schneiden*, v. 3, Apr. 1951, p. 110-112.

Review of literature. Development of the Argon-arc and Aircomatic processes. 37 ref. (K1)

357-K. Strength Investigation of One-Sided Fillet-Seam Welds of Different Shapes. (In German.) H. Dienst. *Schweissen und Schneiden*, v. 3, Apr. 1951, p. 112-114.

Tensile strength of one-sided fillet-seam in steel hardly ever exceeds 40% of that of the welded material. Desirable weld designs. (K1, Q27, ST)

358-K. Heavy Plate Spot Welding With Multiple-Current Impulse Control. (In German.) F. Rosenberg. *Schweissen und Schneiden*, v. 3, Apr. 1951, p. 115-116.

Interrupted current flow permits cooling of the surface of heavy steel or Al plate and the accumulation of heat at the point of welding, thus preventing structural changes, internal stresses, and deformation as the results of excessive heating. (K3, ST, Al)

359-K. Advances in the Field of Welding and Cutting. Important Recent Publications on Welding Methods and Economics. (In German.) *Schweissen und Schneiden*, v. 3, May 1951, p. 150-155.

143 references. (K general, G22)

360-K. Possibilities of a Basic Coating on Special-Purpose Electrodes. (In Italian.) Italo Fiorini. *Metallurgia Italiana*, v. 43, Feb. 1951, p. 65-71.

After a general survey of the various types of coatings available for welding electrodes for ferrous materials, the origin and development of the basic electrode is described. Results of tests on high-creep-limit weld-metal deposits and with heat and wear resistant weld metals. (K1, Fe, ST)

361-K. Welded Frame Allows Re-Use of Century-Old Building. E. E. Goehringer. *Engineering News-Record*, v. 146, June 14, 1951, p. 37.

Conversion of a 100-year-old grain elevator into a five-story warehouse at a total cost of $1.85 per sq. ft., using standard shapes and lengths. (K1, T26, CN)

362-K. The Physical Aspect of Glass-Metal Sealability in the Electronic Tube Industry. Georges Trebuchon and Jacques Kieffer. *Glass Industry*, v. 32, Apr. 1951, p. 165-174, 192, 194, 196, 200, 202; May 1951, p. 240-247, 254-255; June 1951, p. 290-295. (Translated from *Verres et Réfractaires*.)

Previously abstracted from original. See item 173-K, 1951. (K11)

363-K. Oxy-Argon Gas Speeds Up Welding. *Iron Age*, v. 167, June 14, 1951, p. 85.

New process said to multiply the speed of inert-gas shielded-arc welding of stainless and carbon steels announced by Linde Air Products Co. Unusual results are obtained by use of a mixture of O_2 in argon as a shielding atmosphere. (K1, SS, CN)

364-K. Duplex Setup Solders Type to Typewriter Bars. Herbert Chase. *Steel*, v. 128, June 18, 1951, p. 76.

Double-flame arrangement for heating which guarantees precise fastening of type characters to each of 42 bars. Alignment after soldering is checked by comparator. (K7)

365-K. More Welding at Fort Peck. T. B. Jefferson. *Welding Engineer*, v. 36, June 1951, p. 17-19, 31.

Fabrication of a 65-ton riser tee to connect a penstock with the surge tower at Fort Peck dam. (K1, T26, CN)

366-K. First All-Welded Bessemer Converters. H. L. McFeaters. *Welding Engineer*, v. 36, June 1951, p. 20-21.

How four 25-ton converters were fabricated for National Tube Co. Lighter, cleaner, and more streamlined equipment resulted from changing to welded construction. (K1, T5, CN)

367-K. Canada's Welded Passenger Cars. Hugh G. Jarman. *Welding Engineer*, v. 36, June 1951, p. 26-27.

Production for Canadian National Railways, using submerged-arc welding. (K1, T23, CN)

368-K. Welded Towers for Television. Robert A. Hunerwadel. *Welding Engineer*, v. 36, June 1951, p. 35.

Towers made for rural reception by a small company in Chattanooga. (K general, T1, CN)

369-K. 47% Saving. Charles G. Herbruck. *Welding Engineer*, v. 36. June 1951, p. 36-37.

How good design in changing the base of a radial drill and arm router from cast iron to welded steel has reduced manufacturing costs 47% for Onsrud Machine Works, Chicago. (K general, T5, CN)

370-K. De Havilland Comet: Planning and Production Methods. Part I. Design and Production Liaison; Fuselage Tooling and Construction. Part II. Construction and Tooling of the Wing; Plaster Models; Glass-Cloth Moulding. H. Povey. *Aircraft Production*, v. 13, May 1951, p. 134-141; June 1951, p. 170-178.

Various phases including Redux bonding of metals to nonmetals, riveting, etc. (K11, K13)

371-K. Assembly by Brazing. H. R. Brooker. *Metal Industry*, v. 78, May 25, 1951, p. 426.

British standard which assists process control. (K8)

372-K. The Work of the Welding Engineer, P. L. Pocock. *Metallurgia*, v. 43, May 1951, p. 249-252.

An illustrated survey. (K general)

373-K. Automatic or Hand Welding? (In German.) Hermann Stern. *Schweisstechnik*, v. 5, Mar. 1951, p. 25-30.

Compares automatic and hand methods of arc welding from the standpoints of quality and economy. (To be continued.) (K1)

374-K. Copper and Copper Alloys as Addition Materials for Welding and Soldering. (In German.) Benno Sixt. *Schweisstechnik*, v. 5, Mar. 1951, p. 30-34.

Experimental results with Cu, Cu-Zn, Cu-Sn, and Cu-Al welding rods. Photographs, charts, and tables are presented. (To be continued.) (K1, K7, T5, Cu)

375-K. Application of Carbon-Containing Ferromanganese in the Coatings of High-Efficiency Electrodes. (In Russian) L. M. Yarovinskii and V. V. Bazhenov. *Avtogennoe Delo* (Welding), v. 22, Jan. 1951, p. 3-9.

Proposes replacement of low-carbon ferromanganese, produced in the electric furnace and used in the coating of welding electrodes, by less expensive blast-furnace ferromanganese. The first experiments on such substitution resulted in pore formation in welds in steel. Experimental investigation clearly indicates causes of the pore formation and describes a method for its elimination. (K1, T5, ST)

376-K. Gas Formation and its Elimination in Electrode Coatings Containing Ferrosilicon. (In Russian.) A. N. Shashkov. *Avtogennoe Delo* (Welding), v. 22, Jan. 1951, p. 9-11.

The problem of gas formation during welding. Theoretical considerations, together with experimental investigation, resulted in development of a method for elimination of this troublesome phenomenon. (K1, T5)

L

CLEANING, COATING AND FINISHING

424-L. Vinyl-Dispersion-Resin Metal Coatings. C. W. Patton. *American Paint Journal*, v. 35, May 28, 1951, p. 60, 62, 64, 66, 68, 70, 72-73, 76.

Previously abstracted from *Official Digest*. See item 409-L, 1951. (L26)

425-L. Effect of Ferrous and Sodium Sulphate on the Rate of Nickel Deposition. J. M. Zander and O. C. Linhart. *Better Enameling*, v. 22, May 1951, p. 6-7.

Investigation as applied to deposition of a Ni flash on steel surfaces prior to vitreous enameling. (L27, Ni)

426-L. Ceramics for the Hot Spots; The Role of Heat Resistant Coatings in the Aircraft Industry. *Better Enameling*, v. 22, May 1951, p. 8-11.

Practice at Ryan Aeronautical Co. In order to withstand temperatures above 1900° C., ceramic coatings are applied to heat resistant alloy steels. (L27, AY, SG-h)

427-L. HAE—A New Coating to Protect Magnesium Against Corrosion, Abrasion, Heat. *Modern Metals*, v. 7, May 1951, p. 36, 38.

New electrochemical surface coating developed by H. A. Evangelides, an electrochemist at Frankford Arsenal. (L17, Mg)

428-L. Abrasive Cleaning of Surfaces Prior to Finishing. *Organic Finishing*, v. 12, May 1951, p. 22-24.

Miscellaneous equipment and procedures. (L10)

429-L. Protective Coatings Research by the U. S. Army Ordnance Corps. *Paint and Varnish Production*, v. 41, May 1951, p. 12-14, 27. (L general)

430-L. How Dodge Hardfaces Gear Forging Dies. John C. McComb. *Steel Processing*, v. 37, May 1951, p. 231, 257.

Method of increasing the life of press-forging dies through hardfacing critical points of the die surface. (L24, F22, SG-m)

431-L. Rust Proof Steel Drums With Full Color Designs Turned Out by New Coating and Forming Method. E. C. Bergen. *Western Metals*, v. 9, May 1951, p. 41-43.

Equipment and procedures of Rheem Mfg. Co., Richmond, Calif. Includes forming, finishing, and resistance welding operations. (L14, G general, K3, CN)

432-L. Industrial Nickel Plating in the United States. W. H. Prine. *Metal Industry*, v. 78, May 11, 1951, p. 383-388.

An illustrated review. (L17, Ni)

433-L. Investigation of Present-Day Enameling Sheets With Respect to Their Chromium Content. (In German.) A. Dietzel and F. Schneider. *Berichte der Deutschen Keramischen Gesellschaft e.V. und des Vereins Deutscher Emailfachleute e.V.*, v. 28, Feb. 1951, p. 81-82.

Cr is detrimental to the adherence of enamel. A maximum of 0.3% Cr in sheet steel is said to be particularly undesirable. (L27, ST)

434-L. Defects in Enameled Sheet Metal Encountered in Practice. (In German.) A. Thürmer. *Sprechsaal für Keramik; Glas; Email*, v. 84, Apr. 20, 1951, p. 145-147.

Defects resulting from faulty pretreatment of the base material, defects in sheet metal or enamel, and defects resulting from inexpert or careless workmanship. Two photomicrographs show defects of poros-

ity and cavities resulting from entrapment of gases. (L27)

435-L. Ceramic Decoration With Precious Metals. (In German.) *Sprechsaal für Keramik; Glas; Email,* v. 84, Apr. 5, 1951, p. 127-132; Apr. 20, 1951, p. 150-153.

Procedures and specifications for decorating porcelain, glass, and ceramics ware with different types of metal powder suspensions. Emphasis is on Au, Ag, and Pt. (L23, Au, Ag, Pt)

436-L. The Structure of Electrodeposited Metals and Alloys. (In German.) Ernst Raub. *Zeitschrift für Elektrochemie und angewandte physikalische Chemie,* v. 55, Mar. 1951, p. 146-151.

Using Ag as an example, effect of polarization on properties and structure of electro deposited metals was investigated. Shows that impurities adsorbed by the cathode and incorporated into the electrolytic metal cause very strong lattice distortions and extraordinary changes in properties of the metals. The formation of alloys may also result in the formation of unstable crystals or highly supersaturated solid solutions. Several other metals and alloys were also studied. 23 ref. (L17, M26)

437-L. Anodic Polishing and Its Relation to Anodic Passivation. (In German.) Kurt Huber. *Zeitschrift für Elektrochemie und angewandte physikalische Chemie,* v. 55, Mar. 1951, p. 165-169.

Reviews literature on theory and mechanism. 49 ref. (L19, R10)

438-L. A Surface Reaction Between Aluminum Monofluoride and Iron at Elevated Temperatures. (In German.) Armin Schneider and Werner Schmidt. *Zeitschrift für Metallkunde,* v. 42, Mar. 1951, p. 73-75.

Shows the possibility of forming, from AlF, a dense, highly adherent diffused layer of Al on heated iron, consisting mostly of chemically resistant $AlFe_3$ which is several times as hard as Fe. High-temperature atmospheric corrosion tests with $AlFe_3$-coated Fe gave excellent results. (L16, R3, Al)

439-L. Report of Committee B-8 on Electrodeposited Metallic Coatings. C. H. Sample, chairman. *American Society for Testing Materials,* Preprint 13, 1951, 27 pages.

Includes recommendations affecting standards and proposed tentative recommended practices for preparation of Zn-base die castings for plating, for preparation of and plating of Al alloys, and for preparation of and plating on stainless steels. (L17, Zn, Al, SS)

440-L. Ceramics in Aircraft Production. *Ceramic Age,* v. 57, May 1951, p. 33-34.

Coating airplane exhaust systems with thick porcelain enamel. Methods of coating and performance characteristics. (L27, CN)

441-L. Porcelain Enamel Solves Aircraft Engine Problem. *Ceramic Industry,* v. 56, June 1951, p. 72-73, 128.

Use of ceramic coatings at Ryan Aeronautical Co. to give improved resistance to heat and corrosive effects of exhaust gases in the exhaust systems of new aircraft piston engines. (L27,SG-h)

442-L. The Facts of Low Pressure Spraying. Roy D. Beck. *Ceramic Industry,* v. 56, June 1951, p. 74-75, 123.

Experiments show the best results can be obtained with porcelain enamel of high specific gravity and low "set." (L27)

443-L. Wet Blasting Prepares Aluminum Surface for Chrome Plate. *Die Castings,* v. 9, June 1951, p. 37-38, 52.

Process which is readily adaptable to the production plating of large quantities of parts or custom plating of individual pieces. The Cr plate is applied directly over the Al surface without chemical or electrolytic preliminary treatment; dimensional tolerances can be closely held and the build-up of edges controlled; and highspeed deposition permits plating rates considerable in excess of those obtained by conventional plating baths. (L17, Al, Cr)

444-L. Bright Nickel Plating on Metallic Single Crystals in the Absence of Addition Agent. Henry Leidheiser, Jr., and Allan T. Gwathmey. *Journal of the Electrochemical Society,* v. 98, June 1951, p. 225-230.

Ni was electrodeposited on electrolytically polished single crystal spheres of Cu and Ni under a wide variety of experimental conditions. X-ray analysis at grazing incidence indicated that the deposit on the (100) face remained monocrystalline, whereas the deposit on the (111) face was polycrystalline from the very start of deposition. The following comparative characteristics of the two types of deposits were determined: composition by spectrographic analysis, current density and current efficiency during deposition, hardness, ductility, porosity, and corrosion resistance. The results may have application in the growth of Ni single crystals by electrodeposition. (L17, M26, Ni, Cu)

445-L. New Plating Process Gives Bright Finish. *Finish,* v. 8, June 1951, p. 25.

Periodic-reverse-current plating of Ni, its advantages, and applications. (L17, Ni)

446-L. Dual Finishing for Metal Tubing. *Finish,* v. 8, June 1951, p. 27.

Manufacture of steel conduit, its exterior plating with Zn, and its interior coating with lacquer. (L17, L26, Zn, ST)

447-L. An Alignment Chart for Computing the Thicknesses of Evaporated Films. A. L. Choen and R. H. Davis. *Journal of the Optical Society of America,* v. 41, May 1951, p. 362-363.

Chart relates thickness, density, distance from source to sample of evaporated materials, angles between the surface and radius vector from the source, and mass of material evaporated. (L25, S14)

448-L. Metal Finishing of Household Equipment at Servel's Plant. Adolph Bregman. *Metal Progress,* v. 59, May 1951, p. 646-649.

Metal finishes employed by Servel fall into two classes, the entirely functional and those that are both functional and decorative. In the first group there are the Cu, Zn, and Sn electroplates, galvanizing, Zn metallizing, and aluminizing; the second group embraces the nonmetallic coatings such as baked enamels, black and aluminized black Japans, porcelain enamel, and "plastic coatings." In addition, a number of surface treatments are employed either as a preparatory step for subsequent surface coating or as a corrosion preventive process. Processes and equipment. (L general, T10)

449-L. Origin and Use of Clad Steel Plate. William G. Theisinger. *Metal Progress,* v. 59, May 1951, p. 671-672, 708, 710, 712, 714, 716.

History and present manufacturing practices for Ni-clad carbon steel. Applications. (L22, T general, Ni, CN)

450-L. Increased Belt Life and Cut With New Contact Wheel. W. K. Van Ormer. *Plating,* v. 38, June 1951, p. 554-555, 557.

New type of rubber contact wheel for abrasive-belt polishing with backstand idler which permits double the output from a standard abrasive belt in those operations where glazing normally occurs. (L10)

451-L. Determination of Plate Thickness on Zinc Base Alloy Diecastings. Harold E. Brown. *Plating,* v. 38, June 1951, p. 556-557.

Rapid method for approximate determination of average thickness on significant surfaces of Zn die castings. Thicknesses of Cr, Ni, and Cu electrodeposits are determined by solution, followed by gravimetric or volumetric procedures. (L17, S11, Cr, Ni, Cu, Zn)

452-L. Choose the Right Nickel Plating System. *Steel,* v. 128, June 4, 1951, p. 94-96, 117-118, 121, 124, 127, 130, 132.

Various bath compositions and plating conditions, their relative advantages and disadvantages for different jobs. (L17, Ni)

453-L. A Tag Tinning Machine. C. Pearce. *Machinery* (London), v. 78, May 17, 1951, p. 823-824.

In telecommunication equipment and light electrical apparatus generally, extensive use is made of soldered connections between wires and tags. Electrotinning is not so satisfactory as a base for soldering connections as hot dipping in a solder bath, and many pieces are dipped by hand. Equipment was designed to tin a wide range of flat and approximately flat parts. (L16, T1, Sn)

454-L. Plating Aluminium With Nickel. J. M. Bryan. *Metal Industry,* v. 78, May 18, 1951, p. 405.

Modified process which proved suitable for commercial application. Solution compositions, plating times, and current densities. (L17, Al, Ni)

455-L. From a Metallurgist's Notebook. Sherardised Castings. H. H. Symonds. *Metal Industry,* v. 78, May 18, 1951, p. 407-408.

Investigation showed that the Sherardising operation could not have produced the structural differences noted. This refuted the allegation that Sherardising of malleable iron castings had caused extreme brittleness. (L15, M27, Zn, CI)

456-L. Tin Plating. Frederick A. Lowenheim. *Metal Industry,* v. 78, May 25, 1951, p. 423-425.

Describes American practice in electro-tinning of cold-rolled strip steel for tinplate. Also discusses general jobbing and manufacturing operations. (L17, Sn, ST)

457-L. The Chromising Process; Treatment of Steel by Gaseous Chromous Chloride. T. Gibson. *Metal Treatment and Drop Forging,* v. 18, May 1951, p. 201-204.

Process now being practiced on a commercial scale by a British firm, and its applications. (L15, ST, Cr)

458-L. On the Theory of Electrolytic Polishing. (In English.) E. Bösiger. *Experientia,* v. 7, May 15, 1951, p. 175-179.

A theory according to which the polishing action results from concentration of anions at points of irregularity of the metal surface. This enrichment is caused by the fact that these high spots have an especially high field strength, resulting in preferential attraction of anions. (L13)

459-L. Formation of Spots on Precious Metal Deposits. (In German.) Walter Burkart. *Metalloberfläche,* Ser. B, v. 3, May 1951, p. 65-66.

Spotting is primarily caused by porosity either in the base metal or in the electrodeposit. Two recommended means for prevention are polishing of the base metal and increasing thickness of the electrodeposit. (L17, EG-c)

460-L. Experiences With Painting Iron, Zinc, and Light Metals. (In German.) G. Hoffmann. *Metalloberfläche,* ser. B, v. 3, May 1951, p. 69-71.

Preparation of the metal surfaces, application and drying of different types of base coats and protective paints, and determination of the

weathering resistance of paints, varnishes, or lacquers. Because of the danger of galvanic action, the importance of insulating different metals against each other is indicated. (L26, Fe, Zn, Al, Mg)

461-L. Physical Principles of the Deposition of Metallic Coatings With the Gas-Heated Wire Spray Gun. (In German.) K. Krekeler and H. Rabenschlag. *Metalloberfläche*, ser. A, v. 5, May 1951, p. 71-74.

Several more or less contradictory theories. A method for computing the velocity required to melt the particles upon impact upon the base metal and of determining the actual impact velocity. Results of an experiment made to determine temperature of the deposited particles show that they are actually deposited in a plastic or molten state and that the base is heated by the force of impact. 10 ref. (L23)

462-L. The Hardness of Hard-Chromium Layers. (In German.) Heinrich Arend. *Metalloberfläche*, Ser. B. v. 3, May 1951, p. 72-76.

Review of literature, confined to a discussion of the various factors that influence the hardness of electrodeposited Cr. Shows that electrolytic conditions determine the type of Cr formed and that the hardest type contains 0.044% H_2. 18 ref. (L17, Cr)

463-L. Defects in the Production of Cast Brass for Special Enameling. (In German.) Edmund R. Thews and Gheorghe Draghincescu. *Metalloberfläche*, ser. A, v. 5, May 1951, p. 76-79.

How base metals can affect the quality of enamels and possibly be responsible for cracking, scaling, and flaking. Specific causes and means of prevention of poor enameling on Tombac alloys (90-10 Cu-Zn) (L27, Cu)

464-L. Weld Deposition of Wear Resistant Alloys on Hard Manganese Steel Tools. (In German.) W. Hummitzsch and A. Schmidt. *Schweissen und Schneiden*, v. 3, May 1951, p. 147-150.

The tough Cr-Mn austenite formed upon the arc-weld deposition of high-Cr alloys on hard Mn steel renders the tools or equipment parts highly resistant to impact and thus greatly increases their life span. (L24, Ts, Ay)

465-L. Anodic Oxidation of Aluminum and its Alloys. (In Italian.) *Alluminio*, v. 20, No. 1, 1951, p. 61-86.

10 references. (L19, Al)

466-L. High-Purity Aluminum-Magnesium Alloys for Anodic Polishing. (In Italian.) J. Hérenguel. *Metallurgia Italiana*, v. 43, Feb. 1951, p. 72-73.

Conditions for production of polished surfaces by anodic treatment of Al-Mg alloys. These are absence of separate phases and macroscopic segregations of Mg in the solid solutions, fine grain size, absence of preferential orientations, and choice of oxidizing conditions not favoring anisotropy in the rate of growth of the oxide film. (L19, Al, Mg)

467-L. Electroplating Stainless Steels; A Critical Review With Recommended Practices. Joseph Haas. *Metal Finishing*, v. 49, June 1951, p. 50-54.

Includes data based on experience in plating various types of stainless steels. 11 ref. (L17, SS)

468-L. Production Plating of Plastics. W. A. Raymond. *Metal Finishing*, v. 49, June 1951, p. 55-57.

Equipment, procedures, and applications. (L17)

469-L. Bright Zinc Plating. R. O. Hull and J. B. Winters. *Metal Finishing*, v. 49, June 1951, p. 58-61, 63.

Details of bath compositions, plating conditions, analytical procedures, etc. (L17, Zn, ST)

470-L. Rinsability and Buffering Action of Alkaline Cleaners. *Metal Finishing*, v. 49, June 1951, p. 62-63.

ASTM proposed methods of testing for rinsing of cleaners and test for buffering action. (L12)

471-L. Fatigue Loss and Gain By Electroplating. J. O. Almen. *Product Engineering*, v. 22, June 1951, p. 109-116.

Reasons for damage caused by electrodeposited metals when plated by methods now in common use. Suggests developments in electroplating processes, whereby electrodeposited coatings may possibly be made as effective as shot peening in increasing fatigue strength of plated machine parts. Platings of Ni and Cr on steel. 14 ref. (L17, Q7, ST, Ni, Cr)

472-L. Porcelain Enamel Coatings. *Product Engineering*, v. 22, June 1951, p. 141-148.

Some new developments including color enamels, one-coat applications, and a large variety of formulations. Chart shows properties of white cover-coat porcelain enamels. (L27, ST)

473-L. Electroplating Aids in Clad Steel Production. S. E. Sangster. *Products Finishing*, v. 15, June 1951, p. 12-16.

Process at Lukens Steel Co. Carbon or low-alloy steel is clad with stainless, monel, Inconel, or Ni. The steel is Ni-plated prior to the actual cladding process. (L22, L17, CN, AY, SS, Ni)

474-L. Aircraft Finish Demonstrates Durability. Gilbert C. Close. *Products Finishing*, v. 15, June 1951, p. 36.

A wing flap which fell into the ocean 5 years ago was found to be in very good condition. Original finish on the flap, principally 24ST Alclad Al sheet, consisted of anodic treatment in a chromic acid bath, a coating of Zn chromate primer con-

forming to specification An-P-656, and a top coat of An-L-29 sky-blue lacquer. In no area had the finish system failed sufficiently to permit corrosion of the underlying material. (L19, L26, R4, Al)

475-L. Automatic Spray Finishing of Aluminum Siding. Richard H. Nappi. *Products Finishing,* v. 15, June 1951, p. 44-46.

Application of enamel finish by Industrial Finishing Co., Long Island City, N. Y. (L26, Al)

476-L. Wear Testing of Hard Chromium Coatings. (In French.) H. Wahl and K. Gebauer. *Métaux Corrosion-Industries,* v. 26, Jan. 1951, p. 29-46.

Methods of testing, apparatus and technique used, establishing optimum conditions of Cr plating. Factors involved, such as temperature of bath, current density, type of bath, etc. Specific fields of application of hard Cr plating. (L17, Q9, Cr)

477-L. (Book) **Industrial Polishing of Metals.** Gerald F. Weill. 194 pages. 1950. Iliffe & Sons, Ltd., Dorset House, Stamford St., London, S.E. 1, England. 21s.

Scientific and practical information on metal polishing in a handbook approach. Shop data are heavy on British practice, but of a general enough nature to be of value to American engineers. History, theory, techniques, procedures, production processes, and associated shop problems. Theory of polished surfaces. (L10)

M

METALLOGRAPHY, CONSTITUTION AND PRIMARY STRUCTURES

146-M. Scattering Phenomena in Electron Microscope Image Formation. C. E. Hall. *Journal of Applied Physics,* v. 22, May 1951, p. 655-662.

Equations are derived for relative intensities in electron-microscope images formed without a limiting aperture in the objective lens. Three components of intensity at the image plane were distinguished. The equations involve two scattering cross sections, both readily measurable under normal operating conditions. Cross sections were measured for Be, SiO, Cr, Ge, Pd, Pt, and U. Effect of altering the beam potential; minimum detectable increment in speciment thickness due to scattering is estimated. 12 ref. (M21, Be, Cr, Ge, Pd, Pt, U)

147-M. A New X-Ray Diffraction Method for Studying Imperfections of Crystal Structure in Polycrystalline Specimens. Alfred J. Reis, Jerome J. Slade, Jr., and Sigmund Weissmann. *Journal of Applied Physics,* v. 22, May 1951, p. 665-672.

New double-spectrometer method. From intensity data of the diffracted spots and known angular settings of the specimen, angular range of reflection of the misaligned scattering regions in a crystallite is determined statistically. The instrument and the technique of the multiple exposure method. Statistical evaluation of the data, and a mathematical treatment introducing correction terms as functions of azimuth and of Bragg angle. A commercial Si powder specimen was investigated. (M22, Si)

148-M. Oriented Crystals in the Rolled Plates of Alloys. Shigeto Yamaguchi. *Journal of Applied Physics,* v. 22, May 1951, p. 680-681.

Etched surfaces of rolled plate of two stainless steels were detected by means of electron diffraction and the oxide-replica method of electron microscopy. (M27, Q24, SS)

149-M. Studies of Thin Films by Electron Diffraction. N. R. Mukherjee and Oliver Row. *Journal of Applied Physics,* v. 22, May 1951, p. 681-682.

New method for making samples under controlled conditions which provided an opportunity to study optimum conditions for getting good diffraction patterns. Illustrated by typical patterns of Al. (M22, Al)

150-M. The Constitution of Titanium-Rich Alloys of Iron and Titanium. H. W. Worner. *Journal of the Institute of Metals,* v. 79, May 1951, p. 173-188.

Results of metallographic and X-ray investigations. Results of the eutectoid transformations. (M24, Ti)

151-M. Identification and Crystal Habit of Chromium Carbide, $Cr_{23}C_6$, as Determined by Electron Diffraction. J. F. Brown and D. Clark. *Nature,* v. 167, May 5, 1951, p. 728. (M26, Cr, C-n)

152-M. Photomicrography Without Microscope or Camera. H. Courtney Bryson. *Paint Manufacture,* v. 21, May 1951, p. 176-178, 180.

In the procedure described a plastic replica is first taken. This thin film is then placed in an enlarger and a photomicrograph up to several thousand magnifications is readily obtained. (M23)

153-M. Distribution of Lead in Stainless Steel Studied by Means of High-Resolution Autoradiography. L. G. Erwall and M. Hillert. *Research,* v. 4, May 1951, p. 242-244.

Object of investigation was to determine the distribution of Pb in stainless steel containing only 0.004% Pb, since even small amounts cause rolling difficulties. Includes macrographs (7X) and micrographs (75X). (M23, Pb, SS)

154-M. Application and Limits of the Replica Process in the Electron-Microscopic Investigation of Metal Surfaces. (In German.) Johanna Hunger, *Zeitschrift für Metallkunde,* v. 42, Mar. 1951, p. 65-72.

Shows to what extent various metals and alloys lend themselves to this method. (M21)

155-M. Metallographic Techniques for High Purity Aluminum. Italo S. Servi and Nicholas J. Grant. *Journal of Metals,* v. 3, June 1951; *Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 191, 1951, p. 473. (M21, Al)

156-M. Applications of Polystyrene Particles in Conjunction With Shadow Casting to the Study of Polished Metallic Surfaces. I-Ming Feng. *Journal of Applied Physics,* v. 22, June 1951, p. 820-824.

Results of electron-microscope study. Negative collodion replicas were used. Determination of width and depth of scratches by means of polystyrene particles and shadow casting. Relative merits of different polishing techniques. (M21, L10)

157-M. Modification of a Positive-Replica Technique for Electron Microscopy. A. E. Austin and C. M. Schwartz. *Journal of Applied Physics,* v. 22, June 1951, p. 847-848.

In the technique previously described by the authors a thin positive Formvar replica was cast upon a thick negative polyvinyl alcohol replica which was subsequently dissolved away in water. This technique proved to be satisfactory in principle, but in the case of several alloys, corrosion occurred during drying of the aqueous solution of polyvinyl alcohol. This difficulty has been overcome by substitution of zapon Acquantite "A" lacquer for the water-soluble PVA. (M21)

158-M. Aluminum-Rich Binary Alloys. F. R. Morral, compiler. *Metal Progress,* v. 59, May 1951, p. 672B.

Tabulates crystal-structure types, size factors, solid solubilities, lattice constants, melting points and compositions of eutectic, and second phases. (M24, M26, Al)

159-M. The Structure of Thorium Dicarbide by X-Ray and Neutron Diffraction. Elton B. Hunt and R. E. Rundle. *U. S. Atomic Energy Commission,* AECD-3021, Dec. 11, 1950, 13 pages. (M26, Th, C-n)

160-M. Investigation of Alloy Systems by Thermal Effects: Thermal Analysis. C. Sykes. *Metal Industry,* v. 78, May 11, 1951, p. 379-381; May 18, 1951, p. 409.

Study of thermal effects can provide experimental data which may prove to be of great assistance in the establishment of equilibrium diagrams. Apparatus and typical data. (M23, M24)

161-M. Determination of Phase Boundaries in Solid Alloy Systems by a Diffusion Technique. C. E. Ransley. *Nature,* v. 167, May 19, 1951, p. 814.

Principle of the method is to segregate the cooperating phases of an alloy on a scale which, although it allows equilibrium to be attained by a diffusion anneal, is yet sufficiently coarse to allow differential chemical analysis to be carried out without difficulty. This can be done very simply by hot-rolling together fairly thick plates of different alloys to form a "sandwich," the alloys being chosen so that certain phases will appear only in one layer of the composite sheet. The total analysis of the sandwich corresponds to the composition of alloy investigated. The composite sheet is rolled to an appropriate thickness, annealed until diffusion is complete, and the separate layers analyzed to determine the final distribution of the mobile element or elements. Data for the Al-Si-Fe system (0.5% Fe and 0-0.75% Si) are charted and discussed. (M27, N1)

162-M. A Modification of the Cohen Procedure for Computing Precision Lattice Constants From Powder Data. (In English.) James B. Hess. *Acta Crystallographica,* v. 4, May 1951, p. 209-215.

The Cohen scheme for weighting the measurements of the lines of powder patterns is shown to be inappropriate, and a modified weighting is proposed. Examples illustrate the resulting improvement in precision. 13 ref. (M26)

163-M. Optical Methods in X-Ray Analysis. I. The Study of Imperfect Structures. (In English.) C. A. Taylor, R. M. Hinde, and H. Lipson. *Acta Crystallographica,* v. 4, May 1951, p. 261-266.

Two-dimensional gratings of holes in cardboard were made and their diffraction patterns observed in a specially constructed large spectrometer (the Bragg X-ray microscope). Application of the method to transition from the cubic to the hexagonal close-packed structure, and to the ordering process in $AuCu_3$. Some rules for guidance in interpretation of the X-ray diffraction patterns of imperfect structures. 18 ref. (M22)

164-M. Fine Structure of Electron-Diffraction Spots Due to Particle Shape and to the Method of Shadow-Casting. (In English.) Goro Honjo and Kazuhiro Mihama. *Acta Crystallographica,* v. 4, May 1951, p. 282.

The multiple fine structure of electron-diffraction rings due to the refraction effect of electrons at surfaces of crystalline particles pro-

vides a method of determining the shape of microcrystals by electron diffraction. Two examples of this method. (M22)

165-M. An X-Ray Technique for the Study of Substructures in Materials. (In English.) P. Gay and P. B. Hirsch. *Acta Crystallographica,* v. 4, May 1951, p. 284-285.

Technique which permits detection of particles misorientated by only a few minutes of arc. Three examples. (M22)

166-M. Application of the Electron Microscope in Inorganic Chemistry. (In German.) Kurt Beyerdorfer. *Fortschritte der chemischen Forschung,* v. 2, No. 1, 1951, p. 57-91.

Includes discussion of the electron microscopic and the preparation of samples. Examples of electron-microscopic studies of carbon, metals and alloys, hydroxides and oxides of bivalent metals, and of Al, ZnO, oxide smokes, and clay minerals. 90 ref. (M21)

167-M. A New Process for Preparation of Alloy Powders for Determining the Phase Boundaries of Metallic Systems. (In German.) F. Lihl. *Metall,* v. 5, May 1951, p. 183-187.

In the proposed process for studying the phase equilibria of metallic systems below 300° C., powders are formed by thermal decomposition or reduction of the solid solutions of compounds of the respective metals under conditions that will result in phase equilibrium of the metals. The procedure and several examples. (M21, H10)

168-M. Micrographic Quantitative Analysis of Ternary Alloys. (In Italian.) Salvatore Amari. *Metallurgia Italiana,* v. 43, Jan. 1951, p. 6-12.

Theoretical, mathematical analysis of binary and ternary relationships as shown on triangular diagrams. The diagrams and arguments do not mention actual alloys, but are generally applicable. (M24)

169-M. Chemical-Physical Research on Specimens of Fine Pyrite Agglomerates. (In Italian.) A. Molaroni. *Metallurgia Italiana,* v. 43, Feb. 1951, 74-79.

Results obtained by application of metallographic methods. By microscopic examination of these materials, it was possible to determine the real proportion in which the various phases are present, their relative distribution in the structure, and identity of the various oxides of Fe. Includes micrographs. (M27, Fe)

170-M. Zone Theory of Solids and Limits of Its Applicability. (In Russian.) F. F. Volkenshtein. *Uspekhi Fizicheskikh Nauk* (Progress in Physical Sciences), v. 43, Jan. 1951, p. 11-29.

Basic premises and certain defects of zone theory in application to crystal-lattice problems, limits of its applicability, applicability to metals and to nonmetals, etc. Two other methods of solving crystal-lattice problems. 15 ref. (M26)

171-M. Phase Diagrams. E. H. Bucknall and P. Hersch. *Metal Industry,* v. 78, June 1, 1951, p. 443-446.

Recommended procedures for use of phase diagrams in practical metallurgical studies. Special care needed in presenting and using phase diagrams for systems with volatile components. 15 ref. (M24)

172-M. The Electrolytic Polishing and Etching of Uranium. B. W. Mott and H. R. Haines. *Metallurgia,* v. 43, May 1951, p. 255-257.

As a result of a study of various methods a number of suitable solutions are suggested. Advantages and limitations. (M21, U)

173-M. An Improvement in the Micrographic Techniques for Study of Temper Brittleness of Low-Alloy Steel. (In French.) Pierre A. Jacquet. *Comptes Rendus hebdomadaires des Séances de l'Académie des Sciences,* v. 232, Apr. 9, 1951, p. 1422-1424.

Improvement consists of taking an imprint of an electropolished surface, thus eliminating impurities. Experimental investigation of the method on a steel containing 0.26% C, 1.30% Cr, and 0.044% P, quenched in oil from the austenitic state, annealed for one hr. at 650° C., and then for 24 hr. at 525° C. (M21, Q23, AY)

174-M. (Book) **The Phase Rule and Heterogeneous Equilibrium.** John E. Ricci. 505 pages. 1951. D. Van Nostrand Co., Ltd., 250 Fourth Ave., New York 3, N. Y.

Basic information needed in solving a wide range of problems relating to identification and characterization of substances and the study of their interaction. Covers the phase relations of systems of 1-5 components—explaining the application of phase diagrams in the various types of systems. Includes a large number of specific examples, with literature references, chosen from many fields, including alloys. Footnote references. (M24)

175-M. (Book) **The Nature of Metals.** Bruce A. Rogers. 248 pages. 1951. American Society for Metals, 7301 Euclid Ave., Cleveland 3, Ohio, and Iowa State College Press, Ames, Iowa. $3.00.

One of a "Series for Self-Education". Arrangement of atoms in metals; theory of alloying; solidification; movement of atoms; the A3 transformation; theory of hardening of steel; deformation of metals; recrystallization; oxidation and corrosion. Includes glossary and questions. (M general, N general, Q24, R1, R2)

N

TRANSFORMATIONS AND RESULTING STRUCTURES

133-N. Lattice and Grain Boundary Self-Diffusion in Silver. R. E. Hoffman and D. Turnbull. *Journal of Applied Physics,* v. 22, May 1951, p. 634-639.

Coefficients of self-diffusion were measured over extended temperature ranges. Empirical equations are developed to represent the data. 18 ref. (N1, Ag)

134-N. X-Ray Measurement of Long-Range Order in β-AgZn. L. Muldawer. *Journal of Applied Physics,* v. 22, May 1951, p. 663-665.

Replacement of small amounts of Ag by Au in AgZn raises the critical temperature for long-range ordering and completely suppresses the zeta-phase. Measurements of T_c were made in a high-temperature camera using several percentages of Au. Variation of long-range order with temperature was determined from measurements of the integrated intensity of the (111) superstructure line, using a compact of filings of composition of 3.5 Au, 46.5 Ag, and 50.0 Zn. (N10, M22, Ag, Zn)

135-N. The Production and Detection of a Non-Equilibrium Number of Vacancies in a Metal. A. S. Nowick. *Physical Review,* ser. 2, v. 82, May 15, 1951, p. 551-552.

The experiments described seem to be the most direct evidence, to date, that diffusion in close-packed metals occurs predominantly through movement of vacancies. It was found that anelastic effects occur in alloys when the two components differ in size. The alloys used were α solid solutions of Ag-Zn; it was found, for example, that total relaxation in an alloy of 29 at .% Zn is about 0.18. (N1)

136-N. Recovery and Recrystallization in Highly Stressed Pure Aluminium. E. A. Owen and J. H. Liu. *Proceedings of the Physical Society,* v. 64, sec. B, May 1, 1951, p. 386-396.

Results of an X-ray study of phenomena observed when polycrystalline pure Al is subjected to heavy compressional stresses. Rate of recovery to the metastable state under various conditions was examined in some detail. Results are considered in the light of dislocation theory. (N4, N5, Al)

137-N. Grain Growth in a Texture Studied by Means of Electron-Emission Microscopy. (In English.) G. W. Rathenau and G. Baas. *Physica,* v. 17, Feb. 1951, p. 117-128.

Grain growth and secondary recrystallization in rolled face-centered Ni-Fe alloys were studied by electron-optical means, an image of the activated hot-metal surface being formed. Grain growth in an imperfect cubic texture proved to be a discontinuous process. 19 ref. (N3, Ni, Fe)

138-N. Transformations in the Copper-Silicon System. (In German.) Wilhelm Hofmann, Jürgen Ziegler, and Heinrich Hanemann. *Zeitschrift für Metallkunde,* v. 42, Feb. 1951, p. 55-57.

A study was made with 22 alloys containing 2-11% Si, melted under N_2, and homogenized 2-4 hr. at 800° C., followed by annealing at 700, 600, and 500° C. The resulting phases were radiographically and microscopically investigated. Constitution diagrams show fairly close agreement of the author's studies with those by C. S. Smith. X-ray pictures and photomicrographs. 10 ref. (N9, Cu)

139-N. The Epitaxy of Alkali Chlorides on Metals. G. W. Johnson. *Journal of Applied Physics,* v. 22, June 1951, p. 797-805.

The alkali chlorides were crystallized from solution on single crystals and on polycrystalline specimens of various metals. Oriented growth was obtained on Ag, Au, Cu, Zn, Pb, Sb, Bi, and Fe. Since oxide films were present on all metals except Ag and Au, it was concluded that the oxides were oriented with respect to the metallic substrate. From results with Ag and Au, it was found that the permissible misfit for epitaxy to occur was of the same order (about 10%) as for ionic pairs. 27 ref. (N5, R2)

140-N. On the Volume Diffusion of Metals. G. J. Dienes. *Journal of Applied Physics,* v. 22, June 1951, p. 848-849.

In a recent paper, the writer described an empirical correlation between frequency factor and activation energy for the above. Zener has advanced a different explanation and several new experimental diffusion studies have appeared in the literature. Comments briefly on these new developments. (N1)

141-N. Growth of Molybdenum Single Crystals. N. K. Chen, R. Maddin, R. B. Pond. *Journal of Metals,* v. 3, June 1951; *Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 191, 1951, p. 461-464.

A method in which the basic idea of the Andrade furnace is utilized. Modifications are employed so that large single crystals of Mo or any refractory metals can be grown. (N12, Mo)

142-N. Origin of the Cube Texture in Face-Centered Cubic Metals. Paul A. Beck. *Journal of Metals,* v. 3, June 1951; *Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 191, 1951, p. 474-475.

Critically discusses the literature. Concludes that the oriented-growth theory of annealing textures readily explains, at least qualitatively, the various conditions and their interrelations that affect the formation of cube texture. 11 ref. (N5)

143-N. Theory of Annealing Textures. Paul A. Beck. *Journal of Metals,* v. 3, June 1951; *Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 191, 1951, p. 475-476.

Critically discusses literature on the above, in which both the "oriented-nucleation" and the "oriented-growth" theory are supported. Believes that the oriented-growth theory is the more promising one. 12 ref. (N5)

144-N. Kinetics of Precipitation in Supercooled Solid Solutions. G. Borelius. *Journal of Metals,* v. 3, June 1951; *Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 191, 1951, p. 477-484.

Institute of Metals Division Lecture. Theoretical concepts; experimental work done at the Royal Institute of Technology in Sweden, using a working hypothesis concerning the influence on nucleation of thermodynamic potential barriers. (N7)

145-N. The Approach of Alloys to Equilibrium; Association With Precipitation and Re-Solution. D. McLean. *Metal Industry,* v. 78, May 18, 1951, p. 399-402.

Phenomenon involves appearance or disappearance of phases which exist under a certain set of conditions. (N7)

146-N. Calorimetric Investigation of Precipitation From Solid Solutions of N in α-Fe. (In English.) G. Borelius, Stig Berglund, and Oleg Avsan. *Arkiv för Fysik,* v. 2, No. 6, 1951, p. 551-557.

Specimens of pure Fe saturated with N_2 were heated at various constant temperatures between 170 and 575° C. to determine equilibria, between N_2 dissolved in α-Fe and the nitride Fe_4N. After quenching, precipitation of N_2 from the solution was studied at constant temperatures of 70 or 94° C. by measuring the heat evolved as a function of time. Integration of the curves thus obtained gives total emission of heat during the precipitation process. From this heat and its dependence on temperature, thermodynamic calculations give heat of solution and solubilities of N_2 at various temperatures. (N7, Fe)

147-N. Principal Metallurgical Mechanisms Encountered During the Transformations of Metals and Alloys. (In French.) Jean Hérenguel. *Revue de l'Aluminium,* v. 28, Apr. 1951, p. 124-130.

Emphasis is on the light metals, but the phenomena discussed are generally applicable. (N general)

148-N. Isothermal Transformation Diagrams for Nickel Steels. I. General Discussion of Diagrams. *Metallurgia,* v. 43, May 1951, p. 234-242.

General aspects of isothermal transformation diagrams, including methods of determination, factors influencing shape of curves, and limitations of their use. Practical application of the information obtained. Diagrams for the more important Ni alloy steels. (To be continued.) (N8, AY)

149-N. Crystallisation of Very Thin Gold Layers. (In French.) Antoine Colombani and Gaston Ranc. *Comptes Rendus hebdomadaires des Séances de l'Academie des Sciences,* v. 232, Apr. 2, 1951, p. 1344-1346.

The layers were deposited by vacuum evaporation on Plexiglas and on NaCl crystals. Electron microscopic investigation showed that layers deposited on Plexiglas do not show microcrystals, even under magnification of 15,000X. A layer deposited on NaCl shows the presence of microcrystals of up to 1000 Å. in diam. Method and technique of investigation. (N15, Au)

150-N. Thermoelastic Analysis of the Transformation of Bronzes. (In French.) Robert Cabarat, Pierre Gence, Léon Guillet, and Albert Portevin. *Comptes Rendus hebdomadaires des Séances de l'Académie des Sciences,* v. 232, Mar. 12, 1951, p. 1041-1042.

Using an apparatus formerly described by Cabarat, transformations in the solid state which take place in Cu-Sn alloys containing 20-32% Sn were investigated. Data are charted; results are discussed. (N6, Cu)

151-N. Diffusion Phenomena in Sintered Metals. (In French.) G. Zapf. *Métaux Corrosion—Industries,* v. 26, Jan. 1951, p. 10-19.

The role of superficial and self-diffusion in objects produced by powder metallurgy. Factors inhibiting selfdiffusion; methods for preventing their inhibiting action are described. Data on various ferrous and nonferrous metals are charted and tabulated. 14 ref. (N1, H15)

P
PHYSICAL PROPERTIES AND TEST METHODS

184-P. The Heat of Reaction of Americium Metal With 1.5 M Hydrochloric Acid and a Note on the Heats of Formation of La^{+3} (aq.) and Pr^{+3} (aq.) H. R. Lohr and B. B. Cunningham. *Journal of the American Chemical Society,* v. 73, May 1951, p. 2025-2028.

15 references. (P12, Am)

185-P. Thermodynamic Investigations on Ternary Amalgams. Carl Wagner. *Journal of Chemical Physics,* v. 19, May 1951, p. 626-631.

Under certain conditions, interaction between positively charged metal ions in an alloy may be considered to be of minor importance as compared to interaction between conduction electrons and metal ions. Reference is made to the change in the solubility of H_2 in Cu by Zn, Sn, Al, Pt, and Ni as alloying elements; to the change in the vapor pressure of Zn dissolved in Cu by Al and Ni, and to the change in the activity of alkali metals dissolved in Hg by Tl. In addition, an equation is derived for calculation of change in activity of one metal dissolved in another metal due to the addition of a third metal, if changes in the activity coefficients with composition for the binary systems are known and interaction between positively charged metal ions can be disregarded. This relation was confirmed for several systems. 44 ref. (P12)

186-P. Partition Functions of Cubic Lattices. E. Fisher. *Journal of Chemical Physics,* v. 19, May 1951, p. 632-640.

The Born-von Karman theory of vibrational specific heats is given an analytical development that is adequate for computation even at low temperatures. Application is made to simple, body-centered, and face-centered cubic lattices. (P12, M26)

187-P. Conductivity of Cold-Worked Metals. Rolf Landauer. *Physical Review,* ser. 2, v. 82, May 15, 1951, p. 520-521.

In the vicinity of an edge-type dislocation, the density of electrons, and therefore the width of the filled portion of the conduction band is not uniform. To keep the electrons in equilibrium, an electrostatic potential is required. The scattering caused by this potential is used to calculate the increased resistance of isotropically cold worked copper. 11 ref. (P15, Cu)

188-P. A Precise Mechanical Measurement of the Gyromagnetic Ratio of Iron. G. G. Scott. *Physical Review,* ser. 2, v. 82, May 15, 1951, p. 542-547.

The sample was wound with a magnetizing coil and supported as a torsional pendulum in an evacuated space almost completely free of residual magnetic fields. Changes in pendulum amplitude were brought about by repeated and synchronized reversals of the magnetizing current. These changes were measured along with corresponding changes in magnetic moment of the sample. The average value obtained was 1.0278 ± 0.0014 times the mass-to-charge ratio of the electron. 10 ref. (P16, Fe)

189-P. Ferromagnetism in the Manganese-Indium System. Walter V. Goeddel and Don. M. Yost. *Physical Review,* ser. 2, v. 82, May 15, 1951, p. 555.

About 25 alloys, varying in Mn content from 3 to 91 wt. % were prepared. Over half of these specimens were found to be ferromagnetic. (P16, Mg, In, SG-np)

190-P. De Haas-van Alphen Effect in Aluminium and Antimony. D. Shoenberg. *Nature,* v. 167, Apr. 21, 1951, p. 646.

Values found at 4.2° K. and below. Defined as periodic field dependence of magnetic susceptibility. (P16, Al, Sb)

191-P. Linear Magnetostriction of Homogeneous Nickel Alloys. (In English.) J. J. Went. *Physica,* v. 17, Feb. 1951, p. 98-116.

Magnetostriction was measured as a function of composition, of induction caused by an external magnetic field, and of temperature. A comprehensive table of data is given. Several general relationships for binary alloys were found. From these data, the magnetostriction for ternary alloys may be calculated. 16 ref. (P16, Ni)

192-P. The Saturation Magneto-Resistance of Ferromagnetic Alloys. R. Parker. *Proceedings of the Physical Society,* v. 64, sec. A, May 1, 1951, p. 447-452.

Suggests that the magneto-resistance coefficient of a ferromagnetic alloy is composed of two terms, one associated with the temperature-dependent, the other with the temperature-independent contribution to electrical resistivity. An equation based on this hypothesis is in good agreement with experimental results for Si-Fe alloys. The validity of the equation for other alloys is discussed. 17 ref. (P16, SG-n, p)

193-P. Importance of Inhibitors and Poisons to Research on Electrochemical Processes at Metallic Boundary Layers. (In German.) Hellmut Fischer. *Zeitschrift für Elektrochemie und angewandte physikalische Chemie,* v. 55, Mar. 1951, p. 92-97.

Effects of inhibitors on concentration overvoltage, blocking, crystallization, poisoning, and penetration; reduction and oxidation of inhibitors; changes in crystal growth; sensitivity to inhibitors, and mechanism of the coating of the electrode surface with inhibitors under the influence of electrical current. 23 ref. (P15, R10)

194-P. Importance of the Nature of the Electrode Metal to Electrolytic Reduction and Oxidation Processes. (In

German.) M. von Stackelberg. *Zeitschrift für Elektrochemie und angewandte physikalische Chemie,* v. 55, Mar. 1951, p. 120-121.

Shows that the metal not only determines the velocity constant of the reaction, but also the cause of all other electrochemical reactions in the respective electrolytes. The greater the H_2 overvoltage at the cathode, the greater is the "reducing power" of the cathode. Effects of different electrode metals. (P15)

195-P. Studies on Anodic and Cathodic Polarization of Metals. (In German.) R. Piontelli. *Zeitschrift für Elektrochemie und angewandte physikalische Chemie,* v. 55, Mar. 1951, p. 128-143; disc., p. 143.

Theoretical and experimental research results on the electrochemical behavior of metals obtained by the author's organization during the past year. 58 ref. (P15)

196-P. The Electrochemical Characterization of Corrosion and Other Reactions in Metal-Solution Systems; The Potential-pH Diagram of the Silver-Solution System According to M. Pourbaix. (In German.) Kurt Nagel. *Zeitschrift für Elektrochemie und angewandte physikalische Chemie,* v. 55, Mar. 1951, p. 144-145.

Discuss theoretically ion exchange in the Ag-solution system in relation to pressure and concentration. (P15, R1, Ag)

197-P. Potential Buildup on Aluminum in Aqueous Common-Salt Solution. 2. (In German.) R. Ergang, G. Masing, and M. Möhling. *Zeitschrift für Elektrochemie und angewandte physikalische Chemie,* v. 55, Mar. 1951, p. 160-165.

After reviewing earlier work on the electrochemical behavior of Al, a study of the true polarization of anode surfaces is described. (P15, Al)

198-P. Hydrogen Overvoltage on Individual Cadmium-Crystal Surfaces. (In German.) E. Albrecht. *Zeitschrift für Elektrochemie und angewandte physikalische Chemie,* v. 55, Mar. 1951, p. 173-174.

Experimentally determined on monocrystals of Cd. (P15, Cd)

199-P. The Time Curve of the Electrical Potential of Several Metals After Abrading Them in Vacuum. (In German.) F. Fianda and E. Lange. *Zeitschrift für Elektrochemie und angewandte physikalische Chemie,* v. 55, Apr. 1951, p. 237-244.

Experimental results show that work function of freshly abraded metals changes rapidly. The main cause of this phenomenon is assumed to be chemisorption of O_2. Metals inevstigated were Ag, Cu, Sn, Zn, Cd, Pb, Al, and Mg. 50 ref. (P15, EG-a)

200-P. Thermal and Electrical Conductivity of Aluminum and Several Aluminum Alloys at Temperatures up to 400° C. (In German.) Walter Bungardt and Rudolph Kaltenbach. *Zeitschrift für Metallkunde,* v. 42, Mar. 1951, p. 82-91.

A stationary process for determining thermal conductivity of metals—especially suitable for above temperatures, and having an accuracy of $\pm 3\%$. Also thermal and electrical conductivities of Al and of Al-Cu-Mg and Al-Si-Cu alloys. 11 ref. (P11, P15, Al)

201-P. Thermo-Electric Homogeneity Effect in Fine-Crystalline Metal Wires. (In German.) Isolde Dietrich. *Zeitschrift für Physik,* v. 129, Apr. 1951, p. 440-448.

A theoretical and experimental study was made to determine the probability of thermo-electric homogeneity effect in Au and Pt fine-crystalline wires. Results show that the effect—if present—can scarcely be detected even with highly sensitive methods. (P15, Au, Pt)

202-P. Effect of Alloying Elements on the Electrical Resistivity of Aluminum Alloys. A. T. Robinson and J. E. Dorn. *Journal of Metals,* v. 3, June 1951; *Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 191, 1951, p. 457-460.

Electrical resistivities of Al alloys containing Cu, Ge, Zn, Ag, Cd, and Mg were found to increase linearly with atomic percentage of the solute atoms. Application of Linde's rule to these data suggests that each Al atom contributes 2.5 electrons to the metallic bond. 14 ref. (P15, Al)

203-P. Magnetic Properties of Nodular Cast Iron. H. E. Stauss. *Foundry Trade Journal,* v. 90, May 24, 1951, p. 553-554.

Data given by A. B. Everest in a recent paper have been re-oriented to reveal additional information comparing the magnetic properties of nodular cast irons with ordinary irons. (P16, CI)

204-P. Practical Thermodynamics. Application to the Development of Alloy Theory. G. V. Raynor. *Metal Industry,* v. 78, May 25, 1951, p. 419-421, 429.

Examples show that the practical investigation of thermodynamic quantities is of considerable importance to the development of alloy theory. (P12)

205-P. A Phenomenological Derivation of the First- and Second-Order Magnetostriction and Morphic Effects for a Nickel Crystal. W. P. Mason. *Physical Review,* v. 82, June 1, 1951, p. 715-723.

In order to account for experimental results which showed that saturation elastic constants of a single Ni crystal varied with direction of magnetization, a phenomenological investigation was made of stress, strain, and magnetic relations for single Ni crystals. The variation in elastic constants is shown to be a "morphic" effect caused by the change in the crystal symmetry due to the magnetostriction effect. Shows that the morphic effects involve six measurable constants. Some of these are evaluated experimentally. (P16, Ni)

206-P. Relation Between the Atomic Vibrations of Metals in the Solid State and Their Heat of Fusion. (In French.) Léon Jollivet. *Comptes Rendus hebdomadaires des Séances de l'Académie des Sciences,* v. 232, Mar. 5, 1951, p. 966-968.

Theoretical method for determining relation. Experimental investigation on a series of elements (Al, Mg, Ca, Co, Cu, Ni, Ag, Sr, Pd, Au, Pb, Pt, Li, Na, K, Rb, and Cs) shows applicability of the method. (P12, EG-a)

207-P. Effect of Cold Working on the Electrical Resistance of Iron-Chromium-Aluminum Alloys. (In German.) Alfred Schulze. *Zeitschrift für Metallkunde,* v. 42, Apr. 1951, p. 120-122.

Measurements on four types of these alloys show that annealing increases, while deformation decreases, their resistances. (P15, Fe, Cr, Al)

208-P. The Thermodynamic Properties of Liquid Ternary Cadmium Solutions. John F. Elliot and John Chipman. *Journal of the American Chemical Society,* v. 73, June 1951, p. 2682-2693.

The ternary systems Cd-Pb-Bi, Cd-Pb-Sb, and Cd-Pb-Sn were investigated by electrode-potential methods over the range 380 to 600° C. Thermodynamic properties and activities are computed for the three ternary solutions and the Pb-Sn binary solution at 500° C. 13 ref. (P12, Cd)

209-P. Relation of Changes in the Cementite Curie Temperature to Textural Strains in Steel. D. V. Wilson. *Nature,* v. 167, June 2, 1951, p. 899-900.

Variations of the above temperature relationship in a series of cold worked steels were explored using a thermomagnetic balance similar to that developed by Sucksmith. The results do not support an explanation in terms of the production of a new carbide phase. It appears that all the cementite present is changed to some extent by even moderate cold working; and it is the extent of the change, not the proportion of cementite affected, which varies with degree of deformation. (P16, N5, ST)

210-P. Nature of the β-Phase of the Nickel-Aluminum System. (In Russian.) L. N. Guseva. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 77, Mar. 21, 1951, p. 415-418.

Changes in electrical conductivity of Ni-Al alloys with composition in the β-phase range (45.25-60 at. % Ni), were investigated. Nature of structural characteristics and transformations in this range is deduced on the basis of the results. (P15, M26, N11, Ni, Al)

211-P. (Book) Metallurgical Thermochemistry. O. Kubaschewski and E. Ll. Evans. 368 pages. 1950. Butterworth-Springer, London. 35 s.

Opens with an elementary account of the main thermodynamic functions used in the classical treatment of solutions and heterogeneous equilibria. Experimental techniques commonly used to obtain thermal, free-energy, and equilibrium data. Methods of estimating thermochemical data, in order that approximate calculations may be made of the thermodynamic properties of systems for which complete experimental data are not available. Thermodynamic properties for many elements and compounds of metallurgical interest. Some examples of the thermodynamic treatment of metallurgical problems. (P12)

Q

MECHANICAL PROPERTIES AND TEST METHODS; DEFORMATION

318-Q. Some Quantitative Data Bearing on the Scabbing of Metals Under Explosive Attack. John S. Rinehart. *Journal of Applied Physics,* v. 22, May 1951, p. 555-560.

Fracturing, or scabbing, of a material near a free surface as the result of a transient compressional stress wave of high intensity impinging on that surface has been observed for many years. The phenomenon was investigated for 1020 steel, 4130 steel, 24S-T4 alloy, brass, and Cu, using an explosive charge to induce a high-intensity stress wave in the metal. Distribution of pressure within the wave was determined by a modified Hopkinson-bar type of experiment. Scabbing was found to be governed principally by spatial distribution of pressure within the wave and a critical normal fracture stress characteristics of the material and perhaps the state of stress. (Q28, CN, AY, Al, Cu)

319-Q. Internal Friction of Ferromagnetic Materials. A. Ferro and G. Montalenti. *Journal of Applied Physics,* v. 22, May 1951, p. 565-568.

Attempts to verify experimentally the following hypothesis in cyclically stressed ferromagnetic materials, energy loss because of magnetoelastic internal friction is induced by a domain motion due to the applied stress itself. Results appear to con-

firm the assumptions. Materials tested were 99.5% Ni and several steels. 10 ref.

(Q22, P16, ST, Ni, SG-n, p)

320-Q. The Plastic Deformation of Pure Single Crystals of Lead and Copper. Peter W. Neurath and James S. Koehler. *Journal of Applied Physics,* v. 22, May 1951, p. 621-626.

Single crystals of 99.999% pure Pb and Cu were grown by the Bridgman method. A tensile-creep apparatus is used. Measurements on Cu at 23 and −190° C. show that for resolved shearing stresses below 0.6 kg. per sq. mm., steady-state creep rate is negligible. Measurements were also made of the steady-state creep of Pb at 25 and 110° C. Results produced by annealing were investigated. (Q24, Pb, Cu)

321-Q. Friction at High Sliding Velocities of Oxide Films on Steel Surfaces Boundary-Lubricated With Stearic-Acid Solutions. Robert L. Johnson, Marshall B. Peterson, and Max A. Swikert. *National Advisory Committee for Aeronautics,* Technical Note 2366, May 1951, 35 pages.

Efficacy of prepared oxide films in this type of lubrication. 18 ref. (Q9, ST)

322-Q. The Strength of Tubes Subjected to Internal Pressure at Very High Temperatures. (In German.) Max Pfender. *Brennstoff-Wärme-Kraft,* v. 3, May 1951, p. 141-143.

Effects of pressure, temperature, and time on deformation and stress conditions in internally stressed steel tubes. Shows that, at temperatures exceeding 525° C., even highly alloyed steels are subject to permanent creep. (Q3)

323-Q. Transverse Properties of Bars of Various Cross-Sections. G. N. J. Gilbert. *British Cast Iron Research Association Journal of Research and Development,* v. 3, Apr. 1951, p. 811-859.

Various shaped test bars were used, all having the same thickness of flange and web and the same cross-sectional area. Results indicate that there is no simple relationship connecting transverse strength and modulus of elasticity with a constant of the section. However, for the sections examined, there was a tendency for transverse rupture stress to decrease with increase of the modulus of section, and for modulus of elasticity to decrease with increase of moment of inertia of the section. Constants were obtained comparing transverse rupture stress and modulus of elasticity of the various sections with a round bar of the same material. From consideration of conditions for equilibrium in a beam under load, a method was developed by which strength of a cast iron of any section shape can be found. (Q27, CI)

324-Q. Comprehensive Mechanical Tests of Two Pearlitic Grey Irons. J. W. Grant. *British Cast Iron Research Association Journal of Research and Development,* v. 3, Apr. 1951, p. 861-875.

Results of a series of tests on irons having nominal tensile strengths of 19 and 22 tons per sq. in., respectively. The tests included transverse, tensile, hardness, impact, shear, torsion, damping capacity, compression, fatigue, electrical resistivity, density, and coefficient of expansion. (Q general P general, CI)

325-Q. Testing and Computation of Static Tensile-Shear Load of Spot-Welded Joints. H. Zschokke and R. Montadon. *Brown Boveri Review,* v. 37, Aug.-Sept. 1950, p. 318-335.

See abstract under similar title from *Engineers' Digest,* item 207-Q, 1951.

(Q2, Q27, K3, CN, SS, Al)

326-Q. Slip and Polygonization in Aluminium. R. W. Cahn. *Journal of the Institute of Metals,* v. 79, May 1951, p. 129-158.

Method for making Al crystals of predetermined orientation from the melt. Development of slip lines during stretching of these crystals was studied in detail, with particular reference to cross slip (localized slip on planes other than the main octahedral plane subject to maximum shear stress) and to deformation bands. Possible reasons for occurrence of bands. 44 ref. (Q24, Al)

327-Q. Three Basic Stages in the Mechanism of Deformation of Metals at Different Temperatures and Strain-Rates. W. A. Wood, G. R. Wilms, and W. A. Rachinger. *Journal of the Institute of Metals,* v. 79, May 1951, p. 159-172.

As temperature of deformation of Al is increased, or as rate of strain at any one temperature is decreased, the mechanism of slip is replaced by a second mechanism termed "cell mechanism". By further reduction in strain-rate at an elevated temperature, the cell mechanism is in turn superseded; this occurs when the cells become comparable in size with the grain itself. This third stage is termed "boundary microflow". Implications in relation to the mechanism of deformation, strain-hardening, and creep. 14 ref. (Q24, Al)

328-Q. The Evaluation of Macroscopic Residual Stresses in Cylindrical Bars. H. Föppl. *Journal of the Iron and Steel Institute,* v. 168, May 1951, p. 15-23.

Theories of stress reversal are confirmed by results calculated from new equations. These results are compared with those calculated from Heyn's and Sachs' equations. Shows that all the stresses can be calculated accurately, even if the strains are measured in only one direction. 24 ref. (Q25)

329-Q. The Role of Alloying Elements in Steel. (In French.) B. Hedde d'Entremont. *Métallurgie et la Construction Mécanique,* v. 82, Nov. 1950, p. 859, 861-863, 865, 867.

The influence of principal alloying elements on the properties of steel. Includes phase diagrams and photomicrographs. (To be continued.) (Q general, M27, AY)

330-Q. Microhardness and Type of Bonding. (In German.) R. Mitsche and E. M. Onitsch. *Mikrochemie vereinigt mit Mikrochimica Acta,* v. 36-37, pt. 2, Jan. 4, 1951, p. 841-862; disc. p. 860-861.

General discussion and specific examples for a wide variety of metallic and nonmetallic materials. Shows that microdetermination of hardness may be applied to identification of materials of any type of bonding. 26 ref. (Q29)

331-Q. Some Practical and Theoretical Problems in Microhardness Testing. (In German.) E. B. Bergsman. *Mikrochemie vereinigt mit Mikrochimica Acta,* v. 36-37, pt. 2, Jan. 4, 1951, p. 831-840.

Discussion is clarified by graphs and photomicrographs. Emphasizes work on metals. 21 ref. (Q29)

332-Q. The Influence of Surface Roughness on the Fatigue Life and Scatter of Test Results of Two Steels. P. G. Fluck. *American Society for Testing Materials,* Preprint 20, 1951, 8 pages.

Results of tests on fatigue specimens of SAE 1035 and 3130 steels prepared by six different methods of surface finishing. The tests show a marked increase in fatigue life—as much as tenfold—due to polishing of the lathe-formed specimens. Groups of 12 similar specimens were tested to provide information on scatter or dispersion of test results. (Q7, CN, AY)

333-Q. Fatigue Problems in Transport Aircraft. William T. Shuler. *Aeronautical Engineering Review,* v. 10, June 1951, p. 20-26.

Facts concerning operating time of modern transport aircraft and incidence of fatigue-type failures in airframes. Civil Air and International Regulations pertaining to fatigue and the administration of these regulations. Some types of fatigue problems occurring in service and corrective and preventive measures taken. (Q7)

334-Q. The Influence of Frequency on the Repeated Bending Life of Acid Lead. John F. Eckel. *American Society for Testing Materials,* Preprint 25, 1951, 12 pages.

A test for Pb strip that utilizes a new type of specimen and a new type of grip. Shows that a definite relationship exists between frequency and the bending life of acid Pb between 0.27 and 0.65% maximum strain per cycle and between 6.63 and 7440 cycles per day. Extrapolation gives an indicated bending life at 1 cycle per day shorter than found in service. (Q5, Pb)

335-Q. Notch-Toughness of Fully Hardened and Tempered Low-Alloy Steels. R. L. Rickett and J. M. Hodge. *American Society for Testing Materials,* Preprint 31, 1951, 14 pages.

Notch-toughness of several low-alloy steels quenched entirely to martensite and then tempered was measured by means of Charpy keyhole-notch impact tests. In general, low-carbon steels were found to be tougher than higher-carbon steels, when the latter were tempered at some higher temperature to produce the same hardness. The tendency for notch-toughness to decrease on tempering at about 600° F. was confirmed. Concludes that the presence of retained austenite probably is not responsible for loss of toughness on tempering at 600° F. (Q6, AY)

336-Q. The Creep Properties of Some Forged and Cast Aluminum Alloys. O. D. Sherby, T. E. Tietz, and J. E. Dorn. *American Society for Testing Materials,* Preprint 33, 1951, 13 pages.

Creep properties of the following Al alloys were obtained for 90, 212, 300, and 400° F. up to 1000 hr. rupture time: B18S-T61, 18S-T61, A51S-T6 forgings; 355-T71, A132-T551, 333-T533 permanent-mold castings; and 355-T71, 142-T77, A355-T51 sand castings. (Q3, Al)

337-Q. Creep Properties of Two Tempers of 63S Extruded Aluminum Alloy. O. D. Sherby and J. E. Dorn. *American Society for Testing Materials,* Preprint 34, 1951, 9 pages.

Creep properties of 63S extruded Al alloy in the T5 and T6 tempers were obtained at 90, 212, 300, and 400° F. up to 1000 hr. rupture time. (Q3, Al)

338-Q. Prediction of Relaxation of Metals From Creep Data. Irving Roberts. *American Society for Testing Materials,* Preprint 37, 1951, 15 pages.

Controversy over evidence that relaxation rates of metals can be predicted from tension-creep data by means of the strain hardening assumption. A theoretical discussion which should help to clarify some of the confusion. Experimental data show that the strain hardening assumption yields accurate results not only for Cu, but also for carbon steel, and for the alloy S-816. 14 ref. (Q3)

339-Q. Cerium Increases Use of Wrought Stainless. *Iron Age,* v. 167, June 7, 1951, p. 106.

Certain "difficult-to-work" high-alloy, corrosion resistant and heat resistant steels can now be readily hot worked. The application, developed by Carpenter Steel Co., involves

addition of small amounts of Ce. (Q23, SS, SG-g, h)

340-Q. Branching of Slip Lines in Alpha-Brass. Harry Czyzewski. *Journal of Applied Physics,* v. 22, June 1951, p. 846.

Some observations of slip that occurred in a specimen of alpha brass containing annealing twins. Includes electron micrograph. (Q24, Cu)

341-Q. Properties Influencing Wear of Metals. T. L. Oberle. *Journal of Metals,* v. 3, June 1951, p. 438-439G.

Factors influencing wear of metals, and also methods for reducing or eliminating this type of waste. 59 ref. (Q9)

342-Q. Deformation Texture of Cold-Drawn Copper Wire. Walter R. Hibbard, Jr. *Journal of Metals,* v. 3, June 1951; *Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 191, 1951, p. 467.

Discusses recent communication by W. A. Backofen (Mar. 1951 issue; item 159-Q, 1951). Shows that correct analysis indicates complete agreement with Hibbard's results. (Q24, Cu)

343-Q. A Study of Fatigue in Metals by Means of X-Ray Strain Measurement. John A. Bennett. *Journal of Research of the National Bureau of Standards,* v. 46, June 1951, p. 457-461.

X-ray determinations of lattice strain were made on steel specimens under a series of static bending moments, using specimens as normalized and after various amounts of fatigue stressing. Slope of the line relating bending moment to lattice strain was found to decrease with increasing numbers of cycles of alternating stress. However, the decrease was of approximately the same magnitude for specimens stressed above and below the fatigue limit, showing that the change was not associated with fatigue damage. (Q7, ST)

344-Q. Effect of Chromium Plating on the Plastic Deformation of SAE 4130 Steel. Hugh L. Logan. *Journal of Research of the National Bureau of Standards,* v. 46, June 1951, p. 472-479.

Effects were evaluated from results of tensile impact, bending, and crushing tests. Cr plating materially reduces percentage of elongation, true stress at beginning of fracture, and ratio of original cross-sectional area to area at beginning of fracture. Values of these properties decreased with increased plating thickness. (Q23, L17, AY, Cr)

345-Q. New Cerium Bearing Alloy Steels Offer Greater Hot Ductility. *Steel,* v. 128, June 4, 1951, p. 98.

Improved properties of Carpenter No. 20, a Ce-containing steel developed by Carpenter Steel Co., Reading, Pa. (Q23, AY)

346-Q. Brittle Coating for Stress Analysis. Greer Ellis. *Tool Engineer,* v. 26, June 1951, p. 35-37.

Procedure, and several case histories. (Q25)

347-Q. Measurement of the Curvature of Stress Trajectories in Photoelastic Models. A. F. C. Brown. *British Journal of Applied Physics,* v. 2, May 1951, p. 138-140.

Use of Jessop's extension of the Lamé-Maxwell equations for separating the principal stresses in a three-dimensional photo-elastic problem depends for its accuracy on a precise knowledge of the curvature of the stress trajectories crossing the line along which the integration process is carried out. A method of measuring these curvatures more accurately, and an example of application of the method to a particular frozen-stress problem. (Q25)

348-Q. The Fatigue Crack as a Stress-Raiser. A. J. Fenner, N. B. Owen, and C. E. Phillips. *Engineering,* v. 171, May 25, 1951, p. 637-638. (A condensation.)

V-notched test pieces of mild steel cut from 3-in. bars were subjected to alternating stress cycles in a 60-ton Schenck machine while being continuously inspected by a magnetic method. The samples were sectioned and examined microscopically following the test period. It was concluded that, under certain conditions, it is possible to initiate a fatigue crack which fails to develop beyond a certain point, though the cyclic conditions of loading remain unchanged. This appears to require an initial stress-concentration factor of a fairly high order, but it is believed that the effect of a fatigue crack, considered as a stress-raiser, may be less severe, in certain cases, than that of the original artificial notch. (Q7, CN)

349-Q. Stress Raisers in Fatigue. R. C. A. Thurston. *Canadian Mining and Metallurgical Bulletin,* v. 44, May 1951, p. 347-354; disc., p. 354-355.

Deleterious effect of notches on the resistance to fatigue of machine components. Graphs show theoretical stress concentration factors for shafts with circular-arc fillets in bending and in torsion. Effect of shot peening, cold rolling, and other operations. Surface finishes and corrosion are shown to affect fatigue resistance. 18 ref. (Q7, G23)

350-Q. Generalization of the Portevin-Le Chatelier Phenomenon on the Basis of Tensile-Test Curves of Light Alloys. (In French.) Aurel Berghezan. *Comptes Rendus hebdomadaires des Séances de l'Académie des Sciences,* v. 232, Mar. 5, 1951, p. 975-977.

Results of investigation show to what extent the kinetics of the above hardening phenomenon can be influenced either by rate of quenching or by additions to the binary solid solution. Experimental investigation on an Al+4% Cu alloy shows possibilities of application to other solid solutions of Al, such as Al-Mg and Al-Zn. (Q27, N7, Al)

351-Q. Displacement of Crystals in a Progressively Rolled Aluminum Monocrystal. (In French.) Raymond Jacquesson and Jack Manenc. *Comptes Rendus hebdomadaires des Séances de l'Académie des Sciences,* v. 232, Mar. 5, 1951, p. 977-979.

Study was made to generalize results of an earlier investigation indicating that the crystallites resulting from dislocation of the crystal suffer the same displacements as the elements of an isotropic medium, submitted to the same deformation. Variation of crystalline structure in Al sheet, initially monocrystalline and successively reduced by rolling, were studied. (Q24, Al)

352-Q. Internal Friction of Molten Gold-Silver Alloys. (In German.) Erich Gebhardt and Manfred Becker. *Zeitschrift für Metallkunde,* v. 42, Apr. 1951, p. 111-117.

Apparatus and procedure for measuring internal friction of molten metals at high temperatures in the absence of air and for determining the correlation between damping and internal friction. 36 ref. (Q22, Au, Ag)

353-Q. Spontaneous Expansion. (In German.) Werner Engelhardt. *Zeitschrift für Metallkunde,* v. 42, Apr. 1951, p. 117-119.

Magnitude and frequency of local stresses at grain boundaries. There are so many possible deviations from the ideal lattice and, thus, a stress-raising effect of position that, as a first approximation, a Gaussian distribution of these effects can be assumed. 11 ref. (Q25)

354-Q. Determination of Stress and Value of Lattice Constants for the Stress-Free State From an X-Ray Back-Reflection Photograph. (In German.) Richard Glocker. *Zeitschrift für Metallkunde,* v. 42, Apr. 1951, p. 122-124.

A general formula for determining the direction in which—in X-ray stress measurements—the expansion becomes zero; also a process of determining from half of the film the stress and from the other half the lattice constant for the unstressed state. The process can always be applied to mono-axial stress conditions and in special cases, to biaxial stress conditions. (Q25, M26)

355-Q. Dynamic Tensile Tests. (In Italian.) F. Gatto. *Alluminio,* v. 20, No. 1, 1951, p. 17-22.

A new method for determining strain-deformation curves during dynamic tests. The proposed method is not subject to increase in error with speed of the test, as is the case with methods hitherto used. It is therefore particularly suitable for tests of very short duration. (Q27)

356-Q. Variation of the No. 1 Band in Polotoelastic Materials Under Tensile Stress. (In Italian.) W. Ruff. *Alluminio,* v. 20, No. 1, 1951, p. 23-28.

Re-examines research done by Rossi in 1910. The tests showed that at present the only photo-elastic material made in the U. S. has negligible variations in the No. 1 band. Neither the German Dekorit V300, nor the English Catalin 800 give satisfactory results in this respect. 21 ref. (Q27)

357-Q. How Titanium Behaves at Temperatures to 900° F. W. Lee Williams. *Iron Age,* v. 167, June 14, 1951, p. 81-84.

Light weight and erosion resistance make Ti a natural for steam-turbine blades. Although the best properties are found in Ti-base alloys, this study shows how commercially pure Ti can be expected to behave in above temperature range. Mechanical properties are tabulated, charted, and discussed. (Q general, Ti)

358-Q. The Propagation of Longitudinal Waves of Plastic Deformation in a Bar of Material Exhibiting a Strain-Rate Effect. L. E. Malvern. *Journal of Applied Mechanics,* v. 18, June 1951; *Transactions of the American Society of Mechanical Engineers,* v. 73, 1951, p. 203-208.

The theory of propagation of longitudinal waves of plastic deformation is extended to apply to materials in which stress is a function of instantaneous plastic strain and strain rate. Solutions are given for an idealized flow law and compared with solutions based upon earlier theories which neglect strain-rate effect. 30 ref. (Q24)

359-Q. Engineering Steels Under Combined Cyclic and Static Stresses. *Journal of Applied Mechanics,* v. 18, June 1951; *Transactions of the American Society of Mechanical Engineers,* v. 73, 1951, p. 211-216.

Several contributors discuss above paper by H. J. Gough (June 1950 issue; see item 415-Q, 1950). Includes author's closure. (Q1, Q5, CN)

360-Q. Transient Creep in Pure Metals. O. H. Wyatt. *Nature,* v. 167, May 26, 1951, p. 866.

When an annealed pure metal is loaded beyond the yield point, deformation continues after the load is applied. At constant stress Andrade has shown that the creep curve consists of strain on loading, followed by decelerating or transient creep, and finally steady-rate creep. Two different equations have been suggested for the transient creep curve. Measurements were made with Cu, Al, and Cd between −196 and 170° C., for a wide range of stresses. It was found that one equation (logarithmic) fits at low-tem-

peratures and another (exponential) at high temperatures, with a composite equation fitting the intermediate range. 10 ref.
(Q3, Cu, Al, Cd)

361-Q. Residual Stresses in Butt-Welded Joints in Pipe Lines. (In Russian.) M. P. Anuchkin. *Avtogennoe Delo* (Welding), v. 22, Jan. 1951, p. 11-14.

Experimentally investigated on steel pipes 325 mm. in diam. having wall thickness of 10 mm. Diagrams show stress values and their distribution. (Q25, K general)

362-Q. (Book) **Contribution a l'Etude des Réactions Mutuelles des Cristaux dans la Déformation des Métaux Polycristallins.** (Contribution to the Study of Mutual Reactions of Crystals in the Deformation of Polycrystalline Metals.) Ed. I. 98 pages. 1950. Publications Scientifiques et Techniques du Ministere de l'Air, 2 rue de la Porte d'Issy, Paris, France. 500 fr.

An investigation of the plastic deformation of polycrystalline metals. Experiments were performed on specimens of Al consisting of single crystals, bi-crystals, and coarse polycrystals, and modes of deformation within the crystals and near the crystal boundaries were studied by means of X-rays, using both the Laue method and a divergent-beam method developed by Guinier. The main conclusion is that the boundary between adjoining crystals does not exert a direct influence of its own upon mode of deformation; it is regarded instead as a frontier across which the crystals interfere with each other. (Q24, Al)

R

CORROSION

225-R. The Oxidation of Pure Iron. J. K. Stanley, J. Von Hoene, and R. T. Huntoon. *Industrial Heating*, v. 18, May 1951, p. 814, 816. (A condensation.)

Previously abstracted from *American Society for Metals*, Preprint 5, 1950. See item 407-R, 1950. (R2, Fe)

226-R. Reactivated Warships Prove That "Mothballing" Worked. C. H. Sigel. *Iron Age*, v. 167, May 24, 1951, p. 85-89.

Prevention of corrosion, protective coatings, and prevention of deterioration of nonmetallic materials by moisture, mold, and mildew.
(R3, L26, ST)

227-R. Corrosion-Prevention Program for T.C.C. Gas Plant at its Smiths Bluff Refinery. C. A. Murray and M. A. Furth. *Oil and Gas Journal*, v. 50, May 24, 1951, p. 112, 115-116, 118, 120, 122.

Failures and replacements necessary in tubular heat-exchange equipment. Prevention measures and benefits to date of the program. (R10)

228-R. The Use of Cathodic Protection With Conventional Paint Systems. L. P. Sudrabin. *Paint and Varnish Production*, v. 41, May 1951, p. 8-11, 27.

Some of the factors to be considered in the electrolytic degradation of paint films on steel. Encourages further development of underwater coatings to be used in combination with controlled cathodic protection. A potential much in excess of 0.73-0.78 volt will tend to accelerate blistering and destroy the paint film, whereas a lower potential may provide only partial protection. (R10, L26, ST)

229-R. Corrosion of Mild Steel and Mild Steel Welds in Sulphate Digesters. R. A. Huseby and M. A. Scheil. *Tappi*, v. 34, May 1951, p. 202-209.

Relative corrosion resistance of modern semi-killed and fully killed steels; corrosion resistance as related to exact chemical analyses; the effect of surface finish; comparative tests on several mild steel welds—manual and submerged arc; corrosion resistance of several low-alloy, high-tensile steels; data on the galvanic effect obtained by coupling mild steel to several stainless steels and effects of various heat treatments. (R general, T28, CN)

230-R. Application of Wagner's Theory of Scaling in the Development of Heat Resistant Alloys. (In German.) Karl Hauffe. *Zeitschrift für Metallkunde*, v. 42, Feb. 1951, p. 34-43.

Shows that Wagner-Schottky's hole-formation theory and Wagner's work on the scaling of pure metals and alloys can be directly applied to development of non-scaling alloys (not including alloys with precious metals). The problem, in general, is to select the components of the alloy in such a manner that the concentration of disturbance centers in the lattice and the mobility of ions are reduced. 62 ref. (R2, SG-g, h)

231-R. Rust and Its Morphology. (In German.) O. Gerhardt. *Werkstoffe und Korrosion*, v. 2, Apr. 1951, p. 129-131.

Formation, transformation, and structures of surface and "under paint" iron rust. Includes photomicrographs. (R3, M27, Fe)

232-R. The Electrochemical Behavior of Iron. (In German.) K. F. Bonhoeffer. *Zeitschrift für Elektrochemie und angewandte physikalische Chemie*, v. 55, Mar. 1951, p. 151-154.

Charts and discusses the voltage curves of 11 different types of iron in acid electrolytes. Resistance to polarization was found to be highly dependent on the iron and is definitely related to corrosion rate. The behavior of Fe is qualitatively explained by the kinetic theory of electrochemical equilibrium.
(R1, P15, Fe)

233-R. The Expansion of Activation to Passive Iron Electrodes. (In German.) U. F. Franck. *Zeitschrift für Elektrochemie und angewandte physikalische Chemie*, v. 55, Mar. 1951, p. 154-160.

Experimental measuring arrangement. A model experiment shows that the primary cause of the spontaneous expansion process is an unstable state which occurs in the simultaneous presence of active and passive areas on the Fe surface. 22 ref. (R11, Fe)

234-R. Local Galvanic Action and Oxide Coatings on Passive Iron. (In German.) W. Schwarz. *Zeitschrift für Elektrochemie und angewandte physikalische Chemie*, v. 55, Mar. 1951, p. 170-172.

The gradual drop in the initially high solution rate of Fe in the electrolyte is explained by local galvanic action between oxide and metal; and the additional amount of dissolved Fe was found to be a measure of the oxide coating.
(R1, R2, Fe)

235-R. The Electrolytic and Chemical Passivation and Activation of Iron. (In German.) K. F. Bonhoeffer and U. F. Franck. *Zeitschrift für Elektrochemie und angewandte physikalische Chemie*, v. 55, Apr. 1951, p. 180-184.

Using the equivalent-current density concept, anodic passivation of Fe in H_2SO_4 and chemical passivation by HNO_3 are studied. This concept is shown to be suitable for dealing with the neutralization of passivity by cathodic treatment or by HCl. (R10, Fe)

236-R. The Tarnishing of Silver in Aqueous Solutions and Properties of the Layers of Tarnish. (In German.) Walther Jaenicke. *Zeitschrift für Elektrochemie und angewandte physikalische Chemie*, v. 55, Apr. 1951, p. 186-193.

Apparatus and procedure for determining the effects of Br, I, and S solutions on Ag. Overvoltage of the corroding Ag electrode was measured against a noncorroding Ag electrode. Graphs. and tables indicate effects of time, temperature, and concentration of the solution on corrosion. Conductivity and mechanism of conductivity of the layer of tarnish was also studied. 25 ref. (R2, R5, Ag)

237-R. Hydrogen Attack of Steel in Refinery Equipment. R. T. Effinger, M. L. Renquist, A. Wachter, and J. G. Wilson. *Petroleum Refiner*, v. 30, May 1951, p. 132-144.

Refer to abstract under similar title appearing in *Oil and Gas Journal*, item 216-R, 1951.
(R1, N1, CN)

238-R. Report of Committee A-5 on Corrosion of Iron and Steel. T. R. Galloway, chairman. *American Society for Testing Materials*, Preprint 4, 1951, 19 pages.

Includes report of subcommittee XV on field tests of wire and wire products and proposed tentative specifications for Zn-coated Fe or steel chain-link fence fabric galvanized before weaving. Subcommittee report presents data on atmospheric corrosion testing. Materials tests were mostly bare steel and Zn-coated wires and wire products but Cu-covered and Pb-coated steel wires and Cr and Cr-Ni steel wires are also included.
(R general, ST, Zn, Cu, Pb)

239-R. Vapor Packaging Keeps Rust Off Weapons, Tools. Gilbert Foster. *Iron Age*, v. 167, June 7, 1951, p. 99-103.

Government specification which covers the new rust preventives that inhibit corrosion by surrounding ferrous weapons and machine tools with protective vapor. Readying a grease-coated M-1 rifle for combat required at least 3 hr. of hard work; on the other hand, a weapon in a corrosion-inhibitor wrapper can be fired minutes after it is unwrapped and wiped off. Cleaning damage is also eliminated. (R10, L26, Fe, ST)

240-R. Anodic Corrosion of Lead in H_2SO_4 Solutions. J. J. Lander. *Journal of the Electrochemical Society*, v. 98, June 1951, p. 213-219.

Pure Pb was anodized at various constant potentials in H_2SO_4 solutions. At potentials below those for PbO_2 formation, a layer of tetragonal PbO is formed near the Pb. $PbSO_4$ is formed as an outer layer. The rate of corrosion of Pb was found to increase with increasing temperature and decreasing acid concentration. 10 ref. (R5, Pb)

241-R. Some Preliminary Studies of Positive Grid Corrosion in the Lead-Acid Cell. J. J. Lander. *Journal of the Electrochemical Society*, v. 98, June 1951, p. 220-224.

PbO_2 undergoes a solid phase reaction with Pb to form tetragonal PbO. An intermediate film of PbO_2 is formed by the corrosion process which does not cycle completely to $PbSO_4$. Grid growth appears to be proportional to the depth of corrosion after an initial period. Electrolyte concentration and cycle time are shown to be important factors in the corrosion process under constant-concentration conditions. These effects are discussed in terms of a cycling cell. (R1, Pb)

242-R. The Mechanism and Rate of Dissolution of Titanium in Hydrofluo-

ric Acid. M. E. Straumanis and P. C. Chen. *Journal of the Electrochemical Society,* v. 98, June 1951, p. 234-240.

Ti dissolves rapidly in HF according to the reaction: $2Ti+6HF \rightarrow 2TiF_3+3H_2$. Formation of the trifluoride was confirmed by titration with $KMnO_4$ solution and by measurement of the amount of H_2 evolved. Rate of dissolution of Ti in HF was determined. 19 ref.
(R5, Ti)

243-R. The Kinetics of the Oxidation of Cobalt. Earl A. Gulbransen and Kenneth F. Andrew. *Journal of the Electrochemical Society,* v. 98, June 1951, p. 241-251.

The vacuum-microbalance method was used to study the effect of time, temperature, pressure, pretreatment, etc., on rate of the reaction below 700° C. The rate data are interpreted in terms of the transition-state theory and calculated energy and entropy of activation for the reaction. An alternate mechanism to that proposed by Valensi is suggested to account for the reaction $Co_3O_4+Co \rightarrow 4CoO_2$. 25 ref. (R2, Co)

244-R. Materials for Fluorine Control Equipment. G. E. Zima and R. N. Doescher. *Metal Progress,* v. 59, May 1951, p. 660-663.

Service experience with various metallic and nonmetallic materials applied to equipment for handling and storage of fluorine at the Jet Propulsion Laboratory, California Institute of Technology. Design details of tanks, flowmeters, feed lines, valves, etc. Ni and high-Ni alloys were the principal metallic materials used. (R6, T29, Ni)

245-R. The Stability of Analytical Weights, Particularly in Chemical Laboratories. P. H. Bigg and F. H. Burch. *British Journal of Applied Physics,* v. 2, May 1951, p. 126-131.

Analytical weights made of various modern materials, including plated types, were subjected to accelerated corrosion and stability tests in five representative chemical laboratories. As regards stability of mass there was little to choose between the weights of austenitic stainless steel, non-magnetic 80+ Ni, 20% Cr, and plated weights; some weights of specially high-polished stainless steel were, however, slightly superior. (R3, SS, Ni)

246-R. Forms and Methods of Corrosive Attack on Aluminum Alloys. I. Binary Cast Alloys. (In German.) Hans Kostron. *Zeitschrift für Metallkunde,* v. 42, Apr. 1951, p. 107-110.

Corrosion of cast binary alloys is largely determined by the solution potential resulting from grain segregation. The untreated casting is subject to both grain-boundary and internal-grain corrosion. Both heterogenizing and homogenizing processes were found to have destructive effects. (R2, Al)

247-R. Galvanic Behaviour of Aluminum. (In Italian.) L. Cavallaro and Giampaolo Bolognesi. *Metallurgia Italiana,* v. 43, Jan. 1951, p. 13-17.

Results of a series of electrochemical measurements on 99.9935% Al, galvanically coupled with different cathode types. The measurements were made in a 3% NaCl solution, with or without addition of $HgCl_2$. Results, compared with those of other measurements, make it possible to derive a particularly low potential for pure Al under spontaneous corrosion conditions. The values of theoretical and experimental potentials obtained by various authors are critically discussed. 14 ref.
(R1, Al)

248-R. Relation Between the Deformation Texture of an Aluminium-Magnesium Alloy and Its Behaviour in the Presence of Mercury. (In Italian.) P. A. Jacquet and A. R. Weill. *Metallurgia Italiana,* v. 43, Feb. 1951, p. 51-65.

See abstract of "Cracking of Aluminum-Magnesium Alloys in Contact With Mercury," *Revue de l'Aluminium,* item 144-R, 1951. (R11, Al)

249-R. Intercrystalline Corrosion of Alloys. (In Russian.) G. V. Akimov. *Izvestiya Akademii Nauk SSSR* (Bulletin of the Academy of Sciences of the USSR), Section of Chemical Sciences, Jan.-Feb. 1951, p. 13-25.

Analyzes different theories of intercrystalline corrosion and strongly emphasizes the theory of polyelectrode systems. A new "microelectrochemical" method of investigation makes it possible to plot a true polarization (corrosion) diagram, thus presenting an objective electrochemical characterization of the process of interaction of crystallites and their boundaries. Briefly reviews protective methods against intercrystalline corrosion. 25 ref.
(R2, R11)

250-R. Influence of Concentration of Acids and Their Aggressiveness in Relation to Carbon Steel. (In Russian.) S. A. Balezin and T. I. Krasovitskaya. *Zhurnal Prikladnoi Khimii* (Journal of Applied Physics), v. 24, Feb. 1951, p. 197-202.

Investigation of rate of solution of eight types of carbon steels in H_2SO_4, HCl, and CH_3COOH at different concentrations established that the activity of these acids is related to their aggressiveness toward carbon steel by the general formula: $\rho=Ka^n$, where K and n are constants, n being characteristic of a specific acid. (R5, CN)

251-R. Protecting Iron From Atmospheric Corrosion by Oil Coatings. (In Russian.) A. Ya. Drinberg and M. G. Rokhlin. *Zhurnal Prikladnoi Khimii* (Journal of Applied Physics), v. 2, Feb. 1951, p. 210-214.

Experiments on production and testing of different oils and unpigmented coatings. Oils studied include tung oil, linseed oil, and cottonseed oil. Effects of aging up to 6 months.
(R3, L26, Fe)

252-R. Protecting Iron From Corrosion With Oil Coatings and Change of Physical Properties of the Latter During Aging. (In Russian.) A. Ya. Drinberg and M. G. Rokhlin. *Zhurnal Prikladnoi Khimii* (Journal of Applied Physics), v. 24, Feb. 1951, p. 215-220.

Apparatus designed to simulate atmospheric conditions plus accelerated aging for study of corrosion protection and physical properties of tung, linseed, and cottonseed oils. Data obtained by use of this apparatus. (R11, R3, L26, Fe)

253-R. Change of Elementary Composition of Oil Films Under Different Aging Conditions. (In Russian.) A. Ya. Drinberg and M. G. Rokhlin. *Zhurnal Prikladnoi Khimii* (Journal of Applied Physics), v. 24, Feb. 1951, p. 220-222.

Detailed investigation showed that films based on pentaerythrate esters of acids of semidrying oils give the best corrosion protection and those based on tung oil, the worst. Influence of different conditions of aging during testing on composition of oil films. (R11, L26, Fe)

254-R. Protecting Water Works Steel Structures Cathodically. Frank P. MacDonald. *Corrosion* (News Section), v. 7, June 1951, p. 1.

Practice of the Cincinnati waterworks. (R10, CN)

255-R. Rosin Amine-Ethylene Oxide Condensates as Corrosion Inhibitors for Mild Steel in Hydrochloric Acid. Edward A. Bried and Harry M. Winn. *Corrosion* (Technical Section), v. 7, June 1951, p. 180-185.

Condensates of ethylene oxide with Rosin Amine D containing 1-31 moles of ethylene oxide per mole of Rosin Amine D were found to act as corrosion inhibitors for mild steel in HCl. The condensate containing 5 moles of ethylene oxide was the most efficient. Other nitrogenous organic materials were found to be less efficient as inhibitors under the conditions tested. 16 ref. (R10, CN)

256-R. Testing Inhibitors of Brine Drippings Corrosion of Railway Tracks and Equipment. G. M. Magee. *Corrosion* (Technical Section), v. 7, June 1951, p. 186-188.

Initial studies indicated that addition of sodium dichromate neutralized with soda ash to the salt and ice in the bunkers of the cars would effectively prevent corrosion from brine drippings. However, because of toxicity of the dichromate it was found necessary to add the inhibitor externally by passing the brine drippings through a suitable filter in order to avoid contamination. Cost of servicing filters appears questionable economically. Later studies indicate that Soldium Polyphos is equally effective and since it is nontoxic can be added directly with the salt. (R10, Fe)

257-R. Some Applications of Organic Corrosion Inhibitors in the Petroleum Industry. Charles M. Blair, Jr. *Corrosion* (Technical Section), v. 7, June 1951, p. 189-195.

Emphasis on applications in oil and gas wells. Mechanics of inhibitor use and recommended methods of application. Corrosion-rate data for a number of typical systems. Mechanism of action of organic inhibitors in reducing corrosion rates of metals. Laboratory and field data on the relation between inhibitor concentration and corrosion rate are analyzed and compared with predictions derived from adsorption theory. 15 ref.
(R10, T28, Fe, ST)

258-R. Corrosion of Railroad Hopper Car Body Sheets. B. J. Kelly. *Corrosion* (Technical Section), v. 7, June 1951, p. 196-201.

Information obtained from a large number of tests of various materials exposed in different kinds of atmospheres was correlated with data obtained from service tests of a few of these materials. Examination of hopper-car bodies constructed of carbon steel, copper steel, and high-strength steels showed that failures in the sheets generally occur in areas where lap joints of ledges permit accumulation of moisture, dirt and fines, and in areas adjacent to stiffening members.
(R3, T23, AY, CN)

259-R. Cathodic Protection Technical Practices. Bulletin III. *Corrosion* (Technical Section), v. 7, June 1951, p. 202-209.

Last of a series of bulletins prepared by the Correlating Committee on Cathodic Protection of the NACE. 57 ref. (R10)

260-R. Corrosion. Mars G. Fontana. *Industrial and Engineering Chemistry,* v. 43, June 1951, p, 89A-90A.

Two new precipitation-hardening stainless steels developed by Armco Steel Corp. are designated 17-7PH and 17-4PH. 17-7PH is 17% Cr, 7% Ni and 17-4PH is 16.5% Cr, 4.25% Ni, 4% Cu. Mechanical properties are tabulated.
(R general, Q general, SS)

261-R. Liquid Vapor Corrosion Inhibitors. H. R. Baker and W. A. Zisman, *Lubrication Engineering,* v. 7, June 1951, p. 117-122.

Progress of post-war research on polar-type rust inhibitors. Structure of soaps and amine-acid complexes, colloid state of polar compounds in non-aqueous systems, adsorption on metals, and the mechanism of cor-

rosion inhibition. Advances in rust-inhibition test methods, including recent work on vapor-work inhibitors. 40 ref. (R10)

262-R. Victory Over Bromine. Albert R. Jasuta. *Modern Packaging,* v. 24, June 1951, p. 117-121.

Development of special monel drums to contain liquid bromine. Results of corrosion tests on carbon steel, Pb, Teflon, Hastelloys A, B, and C, Monel, Ni, polyethylene, Dow metal M, and Haynes Stellite 19P. Diagrams show details of construction of the drums and of suggested emptying system.
(R6, Ni, CN, Pb, Mg)

263-R. Corrosion, Pickling, Inhibition, and Passivation of Metals. (Or Oxidation, Deoxidation, and Antioxidation.) (In French.) J. Frasch. *Métaux Corrosion—Industries,* v. 26, Feb. 1951, p. 81-94.

Attempts to show the intimate relationship between above processes. Factors and mechanisms involved. Confined to ferrous metals. 12 ref.
(R10, L12, Fe, ST)

264-R. The Theory of Oxidation of Metals and Metallic Alloys. (In German.) K. Hauffe. *Werkstoffe und Korrosion,* v. 2, Apr. 1951, p. 131-139.

Reviews literature. Lattice structure as a factor in metallic oxidation. Wagner's theory of the oxidation of pure metals. 58 ref. (To be continued.) (R2)

S

INSPECTION AND CONTROL

233-S. Methods for Sorting Mixed Metals. Antony Doschek. *Instruments,* v. 24, May 1951, p. 522-527, 568, 570.

The methods and instruments discussed are primarily sorting tools. When used as tools to expedite the sorting of the occasional mixup or as production-control equipments, they can be relied upon to discriminate against unwanted conditions only after a thorough study of their behavior has been made through measurements, not only of "acceptable" and "unacceptable" representative standards, but also of standards which lie between, and outside of, extremes of the problem. (S10)

234-S. Operation and Maintenance of Electronically Operated Instrument Equipment. John R. Green. *Iron and Steel Engineer,* v. 28, May 1951, p. 102-107.

Emphasis on steel-plant applications. (S16, S18)

235-S. X-Ray Spectrometer Measures Tin Coating. *Steel Equipment & Maintenance News,* v. 4, May 1951, p. 16-17.

Units are available for checking plating on one side of a sheet at a time or on both sides simultaneously. Time required to effect a point check is approximately ½ min. Thicknesses ranging from 10 micro-in. can be determined within 2%, and over-all sensitivity is such that coatings as thin as 1 micro-in. are detectable. (S14, Sn)

236-S. Processing Metals With Atomic Energy. Thomas A. Dickinson. *Steel Processing,* v. 37, May 1951, p. 221-225, 257.

Use of radioactive isotopes or tracers in investigation of a wide variety of metallurgical and metal-working problems. 16 ref. (S19)

237-S. Prediction and Production of Springs by Statistical Quality Control. Ervin E. Schiesel. *Wire and Wire Products,* v. 26, May 1951, p. 385-388.

Main steps controlled are load testing, coiling, heat treating, and plating. Material is not indicated. (S12, 17)

238-S. From a Metallurgist's Notebook: Cracked Kettle Bodies. H. H. Symonds. *Metal Industry,* v. 78, May 11, 1951, p. 389.

Preliminary examination of cracking in brass kettle bodies showed that there was tarnishing both inside and out. Further examination revealed that cracking was due to the period of time during which the spinnings were kept in stock under unsatisfactory conditions. (S21, Cu)

239-S. Nondestructive Testing of Defective Bimetallic Joints and of Laps in Thin Sheet Metals. (In Dutch.) J. Van Nieuwkoop. *Metalen,* v. 6, Apr. 15, 1951, p. 110-112.

Apparatus especially designed for nondestructive examination of sheet metals for discontinuities and of thin parts for defects in joints. Possibilities and limitations of the apparatus. (S13)

240-S. Development, Present State, and Outlook of Spot Test Analysis. (In English.) Fritz Feigl and Philip W. West. *Mikrochemie vereinigt mit Mikrochimica Acta,* v. 36-37, pt. 1, Jan. 4, 1951, p. 191-205.

Previously abstracted from *American Society for Testing Materials,* "Symposium on Rapid Methods for the Identification of Metals," 1950. See item 156-S, 1951. (S10)

241-S. Methods of Preliminary Concentration Before Spectrochemical Determination of Trace Elements. (In French.) F. Burriel-Marti and J. Ramirez-Munoz. *Mikrochemie vereinigt mit Mikrochimica Acta,* v. 36-37, pt. 1, Jan. 4, 1951, p. 495-512.

Reviews the methods and their application to determination of small quantities of Bi in ternary Pb-rich alloys and to determination of Ba. 21 ref. (S11, Pb)

242-S. A Micromethod for Quantitative Spectrographic Analysis of Archeological Bronzes. (In French.) M. Van Doorselae. *Mikrochemie vereinigt mit Mikrochimica Acta,* v. 36-37, pt. 1, Jan. 4, 1951, p. 513-521.

14 references. (S11, Cu)

243-S. Nondestructive Testing of Large Forgings by Means of Ultrasonics. (In German.) W. Felix. *Schweizer Archiv für angewandte Wissenschaft und Technik,* v. 17, Apr. 1951, p. 107-113.

Metallographic tests prove the adequacy and accuracy of the method. (S13)

244-S. Spectrographic Analysis of Uranium. (In English.) A. Walsh. *Spectrochimica Acta,* v. 4, No. 1, 1950, p. 47-56.

Tentative method for spectrographic determination of impurities in uranium. Estimates of degree of accuracy and sensitivity obtainable. All the quantitative data so far available are limited to determination of Fe, Si, Mn, Cu and Ni, but it is anticipated that the technique will be applicable to other impurities. Suggestions for further improvement of the method. (S11, U)

245-S. Photoelectric Intensity Measurements in the Iron Arc. (In English.) H. M. Crosswhite. *Spectrochimica Acta,* v. 4, No. 2, 1950, p. 122-151.

Techniques which permit measurement of spectral intensities in general with an accuracy of better than 1%, using multiplier phototubes and a recently developed electronic ratio recorder. As a particular application, relative intensities of over 1000 lines from a standard d.c. iron arc were measured. Quantitative data are also given for self-absorption and variation of intensities with excitation conditions. (S11, Fe)

246-S. A Graphical Method for Evaluating Spectrochemical-Alloy Samples Which Contain Three Components. (In German.) A. Keil. *Spectrochimica Acta,* v. 4, No. 2, 1950, p. 165-166. (S11)

247-S. The Spectrographic Analysis of Uranium in Uranium Ores. (In English.) A. Strasheim. *Spectrochimica Acta,* v. 4, No. 3, 1950, p. 200-211.

Three methods are: direct evaporation of the sample with graphite as arc stabilizer in a d.c. arc; prior extraction of U from the ores before the analysis; and direct burning of the sample in a d.c. arc with an enhancing agent. Sensitivities and accuracies of the methods indicate that U contents as low as 0.006% U_3O_8 can be analyzed directly, according to the 3rd procedure, with an accuracy of 11%. 10 ref. (S11, U)

248-S. Identification Lines for Spectral Analysis of Platinum-Rhodium Alloys. (In German.) Wolfgang Koehler. *Spectrochimica Acta,* v. 4, No. 3, 1950, p. 229-232.

Technique for determining trace impurities in Pt-Rh alloys using spark and also interrupted-arc spectra between small foil samples. A list of lines likely to interfere with the most sensitive lines of the impurities is given. (S11, Pt, Rh)

249-S. Quality Control in the Steel Plant by Means of Large-Scale Investigations. (In German.) Karl Daeves. *Stahl und Eisen,* v. 71, Apr. 26, 1951, p. 430-433.

Frequency analyses for S, P, and N, as well as the analysis of American electric-furnace scrap for Cr and Cu show a log-normal distribution as evidence of high quality. Proposes this sort of analysis as a method of quality control and comparison of different steel plants. (S12, ST)

250-S. Status and Development of Heat Treatable Steels. (In German.) Heinz Kiessler. *Stahl und Eisen,* v. 71, Apr. 26, 1951, p. 433-440.

Definition, requirements, and testing methods are followed by a discussion of changes in compositions of heat treatable steels in Germany since 1925 and of the classes and mechanical properties of steels of the new Standard DIN 17,200. This standard is compared with American, French, and English standards. (S22, ST)

251-S. Practical Materials Testing by Means of Ultrasonics. (In German.) H. Krautkrämer and J. Krautkrämer. *Zeitschrift des Vereines Deutscher Ingenieure,* v. 93, May 1, 1951, p. 349-362.

Theory, practice, and applications. Numerous photographs, diagrams, and tabulated data. 18 ref. (S13)

252-S. Noncontacting Thickness Gages for Flat Rolled Steel Products. W. A. Black. *American Iron and Steel Institute,* Preprint, 1951, 35 pages.

Manner and results of use of X-ray and Beta-ray gages for the flat rolled products. Technical descriptions are simplified and expressed in nontechnical language in order to focus attention on actual performance and operating experience. Theoretical possibilities are given only minor consideration. (S14, ST)

253-S. Materials Handling for Bulk Sampling. Joseph Manuele. *American Society for Testing Materials,* Preprint 121, 1951, 4 pages.

It is desirable to have some means of evaluating the average quality of products handled in bulk, within relatively close limits. Explores methods of handling bulk materials in order to permit sampling for determining this average quality. (S12)

254-S. Sampling of Ferrous and Non-Ferrous Alloys—A Bibliography. Albert C. Holler, chairman. *ASTM Bulletin,* May 1951, p. 66-67.

52 references. (S12)

255-S. Apparatus for Differential Thermal Analysis. Duncan McConnell

and J. W. Earley. *Journal of the American Ceramic Society,* v. 34, June 1, 1951, p. 183-187.

Newly designed, automatic, recording equipment which has been combined with temperature-control apparatus, Pt−Pt+10% Rh thermocouples, a Globar furnace, and a newly designed sample holder, for simultaneous production of 3 thermograms (differential-thermal-analysis curves). The apparatus can be employed safely for temperatures up to 1100° C. Complex interrelationships between the recording and control circuits. (S16, M23)

256-S. Direct-Reading Spectrograph is Faster, More Accurate. B. J. Tufty. *Iron Age,* v. 167, June 7, 1951, p. 104-105.

As the spectrum line of each component in an alloy is evaluated, the new French spectrograph described gives a direct reading as well as a printed record on a calibrated drum chart. Photoelectric cells replace the usual photographic plate. (S11)

257-S. Instrumentation in Steelmaking. R. A. Lambert. *Metal Progress,* v. 59, May 1951, p. 657-659.

Report on papers on openhearth production instrumentation presented at Mar. 1951 regional conference of the Pittsburgh section of the Instrument Society of America. (S16, S18, D2, ST)

258-S. Variables Encountered in Tracer Experiments in Metallurgy. C. Dean Starr, John R. Lewis, and Thomas J. Parmley. *Metal Progress,* v. 59, May 1951, p. 673-680.

Variables are examined under various conditions to determine the accuracy necessary to obtain reproducible results. 10 ref. (S19)

259-S. What Causes Tubular Failures? D. C. Neely. *Oil and Gas Journal,* v. 50, May 31, 1951, pt. 1, p. 78-80, 116.

A few typical examples of casing and drill-pipe failures. Possible causes and remedies. (S21, T28, ST)

260-S. Navy Considers Hull Plate Specification Changes. J. E. Walker. *Steel,* v. 128, June 11, 1951, p. 89.

Summarizes proposed changes. (S22, CN)

261-S. Chemical Determination of Thorium in Ores. John C. Ingles. *Canadian Chemistry and Process Industries,* v. 35, May 1951, p. 397-398, 400, 402, 404, 406.

Various methods for separation of Th from ores and rare earths. A procedure is recommended for determination of Th in ores. 11 ref. (S11, Th)

262-S. Improvements in the Design of Ultrasonic Lamination Detection Equipment. H. R. Clayton and R. S. Young. *Journal of Scientific Instruments,* v. 28, May 1951, p. 129-132.

Development of an apparatus for detection of lamination on Al blanks and sheet. Transmission technique used by Sokolov was modified in order to minimize the effect of standing waves which are formed in sheets of specific thicknesses. Tests show that a defect less than ¾ in. diam. can be detected and that contours of a lamination can be traced with a satisfactory accuracy. (S13, Al)

263-S. Spectrographic Determination of Magnesium in Nodular Cast Iron. (In German.) O. Werner. *Giesserei,* v. 38 (new ser., v. 4), May 17, 1951, p. 232-233.

Two methods proposed by T. J. Hugo, and claimed to be more reliable, simpler, and less time-consuming than earlier methods. (S11, CI)

264-S. Isotopes in Metal Fabrication. C. B. Fergusson. *Metal Industry,* v. 78, June 1, 1951, p. 439-441.

A case in which extensive use was made of radon for the examination of welds on a number of heavy vessels recently manufactured for an oil company. (S19, ST)

265-S. From a Metallurgist's Notebook: Cast Letter Plates. H. H. Symonds. *Metal Industry,* v. 78, June 1, 1951, p. 447-448.

Investigation concerned with surface defects in cast brass and gunmetal letter plates. The investigation included visits to the foundry to check casting conditions where a number of modifications were tried with little success. (S13, E11, Cu)

266-S. Colorimetric Determination of Iron; A Review of Known Methods. I. T. S. West. *Metallurgia,* v. 43, Apr. 1951, p. 204-206; May 1951, p. 260-261, 263-264.

81 references. (S11, Fe)

267-S. Determination of the Thickness of Thin Layers Obtained by Condensation of Synthetic Radioactive Elements. (In French.) Marcel Devienne. *Comptes Rendus hebdomadaires des Séances de l'Académie des Sciences,* v. 232, Mar. 12, 1951, p. 1088-1089.

A method particularly suitable to radioactive substances. Radioactivity of the layer is measured and compared with that of a standard layer of the same material. Application experiment to radioactive antimony. Thicknesses used were usually less than 1000 Å. (S14, S19)

268-S. Nondestructive Testing of Materials. Study of Liquation. (In French.) H. de Leiris. *Métaux Corrosion—Industries,* v. 26, Jan. 1951, p. 22-28.

Method in which drops of liquids based on tetralin, propyl alcohol, or xylene, are placed on the surfaces of materials to be examined under the microscope, revealing the location and character of surface defects. (S13)

269-S. (Book) **1950 Supplement to Book of ASTM Standards Including Tentatives. Part I. Ferrous Metals.** 316 pages. 1951. American Society for Testing Materials, 1916 Race St., Philadelphia, Pa. (S22, Fe)

T

APPLICATIONS OF METALS IN EQUIPMENT

240-T. Engineering Developments in Aircraft Production. T. E. Piper. *Automotive Industries,* v. 104, May 15, 1951, p. 34-38, 144, 146.

Includes welding of Al and Mg, stretch forming, extrusion, fabrication of plastics, and glass-fiber laminates.
(T24, K general, G general Al, Mg)

241-T. New Electrodes for Inert-Gas Welding Arcs. J. D. Cobine and C. J. Gallagher. *Electrical Engineering,* v. 70, June 1951, p. 504. (A condensation.)

Includes a diagram of a normal W electrode and photographs of cathode spots on ⅛ in. diam. electrodes of pure W, zirconia-coated W, a thoria core in a sintered W tube, a thoria core in a Cu tube, and a sintered W-thoria electrode are given. (T5, K1, W, Th)

242-T. Engineering Materials in Ordnance Equipment. Benjamin S. Mesick. *Materials & Methods,* v. 33, May 1951, p. 59-63.

Major applications of engineering materials in our military equipment, and some of the current problems now facing the Ordnance Corps. (T2)

243-T. New Developments Expand Use of Lead Construction. Kempton H. Roll. *Materials & Methods,* v. 33, May 1951, p. 69-73.

Sheet lead construction, testing of lead linings and welds, brick and lead linings, bonded lead linings, lead piping and coils, and bonded and lead-covered pipe. (T29, Pb)

244-T. Oil-Pocket Metal Powder Bearings Improve Self-Lubricating Qualities. John Haller. *Materials & Methods,* v. 33, May 1951, p. 80-81.

Interior cavities filled with lubricant prolong bearing life and practically eliminate "freezing" under many adverse operating conditions. The various types and their applications. (T7, H16)

245-T. Europe Studies Tinplate Substitutes. W. G. Cass. *Materials & Methods,* v. 33, May 1951, p. 132, 134, 136, 138.

Reviews recent work in Germany and England.
(T general, Sn, ST)

246-T. The Use of Aluminum in Petroleum Refinery Equipment. E. E. Kerns and W. E. Baker. *Petroleum Refiner,* v. 30, May 1951, p. 123-129.

Some refinery installations of Al in tanks, exchangers, instrument tubing, and insulation weatherproofing. Value of Al as an economical construction material for refinery equipment. Data on mechanical properties, corrosion experience, etc. 12 ref. (T29, Al)

247-T. You Can Save Alloy Steel by Substituting Carbon Grades and by Using Leaner Alloys. P. D. McElfish. *Western Metals,* v. 9, May 1951, p. 29-31.

Possible substitutions and specific recommendations.
(T general, CN, AY)

248-T. Great Care Needed to Produce Resistance Welding Electrodes. Ray J. Thompson. *Western Metals,* v. 9, May 1951, p. 39-40.

Procedures and equipment of Ampco Metal, Inc., at its Burbank, Calif., plant. (T5, K3)

249-T. The Manufacture of Ring Travelers for the Textile Industry. Reed Collins. *Wire and Wire Products,* v. 26, May 1951, p. 390-392.

Parts are of several types, either bronze or steel. Material specifications and fabrication operations, including rolling, finishing, heat treatment, finishing, inspection, etc. (T29, Cu, ST)

250-T. Accessory Manufacture; The Production Methods at the Works of Wilmot Breeden Ltd. *Automobile Engineer,* v. 41, May 1951, p. 171-181.

Miscellaneous procedures and equipment of British firm. The main products are bumpers, locks, window regulators, handles, steering wheels, and interior fittings for automobiles. Includes machining and presswork, heat treatment, form rolling of bumpers, shearing, piercing, polishing and plating, assembly and inspection. (T21)

251-T. Some Problems in the Manufacture of Experimental Gas Turbines. L. H. Leedham. *Institution of Mechanical Engineers, Proceedings,* v. 163, W.E.P. No. 61, 1950, p. 281-290; disc., p. 290-293.
(T25, G general)

252-T. Aluminum Pipe in Low Coal. *Coal Age,* v. 56, June 1951, p. 81.

Use of Al pipe in mines of the New River Co., in Fayette and Raleigh counties, W. Va. Light weight and easy handling reduce labor cost and more than offset extra cost in low coal seams. (T28, Al)

253-T. How to Frame a Glass Enclosure. *Die Castings,* v. 9, June 1951, p. 21, 59-60.

Use of die-cast Zn for the frames of glass-covered areas on meters, dials, gages, etc. Specific application is a gasoline pump. (T8, Zn)

254-T. Some Considerations in the Design of Handles and Knobs. *Die Castings,* v. 9, June 1951, p. 23-24, 60-62.
Various types of die-cast Zn and Al handles, knobs, etc. (T6, Al, Zn)

255-T. Combination of Materials for Jewelry Effects. *Die Castings,* v. 9, June 1951, p. 25-26, 63.
Two examples of the way in which die-cast Zn with brilliant Cr plate can be used to advantage in combination with stamped brass or molded plastic are: the knob for a beer dispenser and the Lincoln horn assembly. (T10, Zn)

256-T. Die Castings Cut Overhead Costs. *Die Castings,* v. 9, June 1951, p. 28-30, 58.
Applications of Al die castings in cloth-cutting machines. (T29, Al)

257-T. Complex Sand Core Eliminated by Die Casting. H. E. Earl and G. R. Wolter. *Die Castings,* v. 9, June 1951, p. 32-34, 57-58.
Analysis of savings made by substitution of die-cast Al for cast iron in fan housings for a blower used in connection with oil burners.
(T7, Al)

258-T. Metal-and-Plastics in Product Design. John Delmonte. *Electrical Manufacturing,* v. 47, June 1951, p. 98-101, 254, 256, 258.
Partnership of both classes can be exploited by intelligent product design, not only to enhance appearance but to provide engineering properties otherwise not obtainable; in some instances intimate compounds of metals and plastics provide entirely new materials.
(T general)

259-T. Conductive Materials for Elevated Operating Temperatures. John T. Richards. *Electrical Manufacturing,* v. 47, June 1951, p. 128-129, 270, 272.
In specifying a material for current-carrying components, consideration should be given to possible effects of temperature rise. Heating may result from current passage, conduction from mating parts, or operation in a warm atmosphere. The influence of temperature on several mechanical and physical characteristics of Cu, brass, bronze, and beryllium-copper is presented graphically.
(T1, P general, Q general, Cu)

260-T. Breeding Ground for Navy's Firepower. *Steel,* v. 128, June 11, 1951, p. 79-81.
Some equipment and procedures in design, development, fabrication and testing of ordnance equipment at Naval Gun Factory, Washington.
(T2)

261-T. Stainless Steel Vital to Aircraft Research. *Steel,* v. 128, June 11, 1951, p. 86, 89.
Use of stainless steel plates to line NACA's supersonic wind tunnel for testing engines under simulated high altitudes. (T24, SS)

262-T. Selecting and Processing Steels for Lamination Dies. Lester F. Spencer. *Tool Engineer,* v. 26, May 1951, p. 25-27; June 1951, p. 42-44.
Compositions and punching properties of various grades of electrical steel sheet. Annealing recommendations to minimize st.ains due to the punching operation. These strains have an adverse effect on electrical properties. Die specifications, including tolerances, compositions, and wear resistances. (T5, G2, TS, AY)

263-T. Production Evaluation of Cutting Tool Materials. Thomas Badger. *Tool Engineer,* v. 26, June 1951, p. 31-34.
Technical factors to be considered in selecting cutting tool materials. Includes design limitations. (T6,TS)

264-T. Aluminium and Its Alloys in the Chemical and Processing Industries. S. M. Lawrence. *Industrial Chemist and Chemical Manufacturer,* v. 27, May 1951, p. 219-224.
Some of the more recent developments in the utilization of Al and its alloys as materials of construction. Data on installation, operation, and maintenance. (T29, Al)

265-T. Cast Iron for Glass Making Molds. (In French.) Jean Guillamon. *Fonderie,* Feb. 1951, p. 2373-2374.
Several types of cast iron particularly adaptable for production of molds for glass. Compositions of these cast irons. (T29, CI)

266-T. Automobile-Engine Cylinders of Chromium-Plated Aluminum. (In French.) *Revue de l'Aluminium,* v. 28, Apr. 1951, p. 131-135.
Replacement of engine cylinders with cast iron sleeves by Cr-plated Al cylinders is said to offer several advantages in efficiency, weight, and price. Technique of Cr-plating Al. Improvement in thermal con ductivity between piston and cooling fluid resulting from use of Al cylinders. (T21, Al, Cr)

267-T. Saoutchik Makes a Light-Alloy Automobile for the Present King of Arabia. (In French.) *Revue de l'Aluminium,* v. 28, Apr. 1951, p. 136-137.
Custom-built car made by a French manufacturer. (T21, Al)

268-T. "As-de-Trefle" Presents: Photography on Aluminum Using the "As-Alu" Sensitive Surface. (In French.) *Revue de l'Aluminium,* v. 28, Apr. 1951, p. 138.
Billboard size "cheesecake" photograph illustrates possibilities of process developed by a French company. An Al sheet, after undergoing a special surface treatment, receives a coating of silver bromide. This sensitive surface is prepared in different sizes and emulsion grades, with a white or metallic underlayer.
(T9, Al)

269-T. Material for Laboratory and Industrial Control Equipment. (In French.) Raymond Guillemot. *Revue de l'Aluminium,* v. 28, Apr. 1951, p. 139-142.
Various new developments in application of Al and its alloys. (T8, Al)

270-T. Aluminum Roof for the Cincinnati Railway Station. (In French.) *Revue de l'Aluminium,* v. 28, Apr. 1951, p. 146-147.
Roof is in the shape of a semispherical dome. Details of construction. (T26)

271-T. Figureheads for the Bow. (In French.) Pierre Vidal. *Revue de l'Aluminium,* v. 28, Apr. 1951, p. 148-151.
Various examples of revival of an old custom. Figureheads for ships' bows are made of cast light alloys with protective coatings. (T22, Al)

272-T. The Arvida Bridge. (In French.) C. J. Pimenoff. *Revue de l'Aluminium,* v. 28, Apr. 1951, p. 153-164.
Details of Canadian suspension bridge made entirely of Al alloys, its design and construction. (T26, Al)

273-T. Alloy Aluminum for Automobile Bodies. *SAE Journal,* v. 59, June 1951, p. 35-39, 46. (Based on "A Modern All-Aluminum Body Development for Production" by E. C. DeSmet. J. H. Dunn, E. J. Zulinski, and C. J. Schmidt.)
A joint research group organized on a cooperative basis engineered and built a complete automobile body to determine what could be done with Al in body structures. Advantages and disadvantages of three possible alloys. Fabrication problems in forming, welding, and finishing, as well as design for rigidity equal to steel. (T21, Al)

274-T. Bus Bars of Aluminum Saved Kaiser 70%. F. W. Douville. *Welding Engineer,* v. 36, June 1951, p. 22-25.
Use for the 7th potline of Kaiser's Al reduction plant near Spokane. The Al was made in this plant, and rolled to size and gage at a nearby Kaiser plant. How the bars were joined by inert-arc metal-arc welding. (T5, K1, Al)

275-T. Electrodes That Stabilize Inert-Gas Arcs. J. D. Cobine and C. J. Gallagher. *Welding Engineer,* v. 36, June 1951, p. 32-34.
See abstract under similar title appearing in *Electrical Engineering;* item 241-T, 1951. (T5, K1)

276-T. (Book) **Ordnance Production Methods.** Charles O. Herb, editor. 534 pages. 1951. The Industrial Press, 148 Lafayette Street, New York 13, N. Y. $10.00.
A collection of articles published in *Machinery* since 1939, describing manufacturing operations on rifles and small arms, machine guns, bullets, shells, cartridge cases, guns, bombs, tanks, and other weapons of war. (T2)

V

MATERIALS
General Coverage of Specific Materials

75-V. Austenitic Stainless Steels, *Materials & Methods,* v. 33, May 1951, p. 99, 101.
Data sheet gives compositions, physical and mechanical properties, thermal treatments, fabrication properties, corrosion resistance, available forms, and uses of seven types of austenitic stainless.
(SS)

76-V. 3 Job-Hungry Metals Now Report for Duty. *Modern Industry,* v. 21, May 15, 1951, p. 48-51.
In, Te, and Tl are said to offer unique alloying abilities and unusual physical properties. Since supplies are said to be ample, properties and present and potential applications are surveyed. (In, Te, Tl)

77-V. Magnesium Output and Uses Multiplying; Doan Foresees Big Demand. Leland I. Doan. *Modern Metals,* v. 7, May 1951, p. 22-26.
President of Dow Chemical Co. outlines his company's views on the past, present, and future development of the industry.
(T general, Mg)

78-V. Hastelloy Alloys. (In German.) E. Franke. *Werkstoffe und Korrosion,* v. 2, Apr. 1951, p. 140-149.
Compositions, properties, and uses of four different Hastelloys, with special emphasis on their chemical resistance to corrosion. 23 ref.
(R general, Ni)

79-V. Nickel-Alloyed Manganese Bronze. James V. Vanick. *Foundry,* v. 79, June 1951, p. 122-125, 226, 228.
Sixth of a series describing properties, applications, and production of these bronzes. Characteristics and foundry practices applicable to Mn bronze. (Cu)

80-V. High-Temperature Steels and Alloys for Gas Turbines. Tom Bishop. *Metal Progress,* v. 59, May 1951, p. 653-656, 690, 692, 694, 696.
Comprehensive report on Iron and Steel Institute Symposium on High-Temperature Steel and Alloys for Gas Turbines, held in London, Feb. 21-22, 1951 (T25, SG-g, h)

81-V. Zirconium. G. L. Miller. *Murex Limited Review,* v. 1, no. 8, 1951, p. 184-194.
Production, fabrication, properties, and applications. 23 ref. (Zr)

82-V. How to Work Titanium and Its Alloys. Anderson Ashburn. *American Machinist,* v. 95, June 11, 1951, p. 145-153.

Includes a series of articles on Ti, which summarize the information now available. Properties, heat treatment, machining, forging, bending, welding, and descaling and cleaning are discussed. (Ti)

83-V. Non-Magnetic Alloys. *Edgar Allen News,* v. 29, May 1951, p. 853-856.

Physical properties and numerous industrial applications, mainly using non-magnetic Mn steel. (To be continued.) (AY)

84-V. Properties of Tin Alloys. W. H. Dennis. *Mine & Quarry Engineering,* v. 17, June 1951, p. 193-196.

Effect of other elements upon Sn, Babbitt metal, solder, fusible alloys, and miscellaneous alloys. (Sn, SG-c)

85-V. Zirconium; Production, Properties and Alloys. G. L. Miller. *Metallurgia,* v. 43, May 1951, p. 209-214, 220. (Zr)

86-V. Notes on Some Recent Progress in the Aluminum and Aluminum-Alloy Industry. (In French.) R. Rohmer. *Revue Génerale des Sciences pures et Appliquées et Bulletin de la Société Philomathique,* v. 57, Nos. 11-12, 1950, p. 278-287.

Reviews literature, including methods of preparation, influence of degree of purity on its properties, protection of the Al surface, various Al alloys, and future possibilities. 77 ref. (Al)

87-V. (Pamphlet) **The Making of Steel.** 1950. 96 pages. American Iron and Steel Institute, 350 Fifth Ave., New York.

Complete details, including all phases of manufacture from mining and shipping to the development of new steels. Primarily it is a textbook for laymen. Complete index. (D general, F general, ST)

A. S. M. Members' Names Added to Quarter-Century Club Roster

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